

# THE WATER WHEEL

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LOWER OLIFANTS:  
Lifeblood of the arid West Coast





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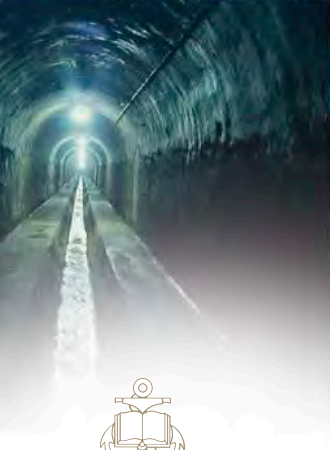
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# CONTENTS

4	<b>UPFRONT</b>
14	<b>IRRIGATION</b> Water use efficiency – Irrigators take the lead in Lower Olifants
18	<b>WETLANDS</b> Princessvlei – Tug of war over Cape Flats wetland continues
22	<b>NATURAL DISASTERS</b> SA mops up following floods
26	<b>WATER HISTORY</b> Kakamas – oasis in the desert
30	<b>AQUATIC ENVIRONMENT</b> Hands-on education a hit in biodiversity hot-spot
36	<b>SOIL AND WATER CONSERVATION</b> Project tests mechanised soil moisture conservation techniques in heavy clay soils
38	<b>CAPACITY BUILDING</b> WRC water harvesting short course materials get the nod
40	<b>WOMEN IN WATER</b> Women share secrets of career success in water
42	<b>ADVERTORIAL</b> Small things may make a big impact on sustainability
44	<b>WATER KIDZ</b> Desalination – turning salty water into drinking water
46	<b>LAST WORD</b> Beneficial role of wetlands highlighted at seminar

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*Cover: South Africa's oldest water user association has achieved significant water savings among users of the Lower Olifants River. See page 14.*





## Letters to the Editor

### What is happening at Beervlei?

I refer to the article on Water History in the latest edition (January/February 2011) of *the Water Wheel*, and particularly the description of the Beervlei Dam on pages 22 and 23 of the magazine ('Kouga Dam – serving the fertile Gamtoos valley').

My wife and I travel two or three times a year from KwaZulu-Natal to the Southern Cape, and drive past the Beervlei Dam, situated between Aberdeen and Willowmore. Some years ago, we noticed that the dam was being emptied. It has now been empty for a number of years. What are the reasons for decommissioning this dam?

We have also noticed that the stream that feeds the dam is just a trickle, and sometimes practically dry.

I always have had an interest in dam design, and an explanation on problems encountered would be most welcomed.

*CL Marechal (Pr Eng)*



### Acid mine drainage – Who will carry financial burden?

In the article on acid mine drainage of *the Water Wheel* January/February 2011 ('Red letter year for authorities to prevent mine-water catastrophe'), Prof Terence McCarthy of the School of Geoscience at the University of the Witwatersrand commenting on who should carry the cost, is quoted as arguing that "government is invariably the largest single beneficiary of mining ventures through the State share of profits formulae, taxation of company profits and taxation of salaries paid to workers." Government will probably carry the cost.

What is intriguing is Prof McCarthy's omission of shareholders as beneficiaries of mining activity and therefore potential funders of initiatives to address acid mine drainage. It would be almost impossible to make past shareholders carry some of the cost. It would be just as impossible to seek restitution from past governments that directly levied the taxes Prof McCarthy alludes to. The government that he argues should carry the cost is actually current taxpayers. If current taxpayers must shoulder the cost why can't current shareholders? Is it maybe a case of implicating the latter may be a career, consulting or funding limiting move?

*Abel Sithole*

## Diamonds not the Vaal's best friend

Authorities from the Northern Cape have expressed their concern about the environmental impacts of often illicit alluvial diamond mining along the Lower Vaal River.

Due to the meandering nature of the Vaal River, diamonds are found both in the river channels and on the floodplains where the river once ran. The deposits are actively mined by large-scale miners, informal and small-scale miners. While these precious stones play an important role in the economy of the Northern Cape, removing them is a destructive process, causing many problems for the environment as well as people living downstream.

Large-scale miners rely heavily on hydraulic mining techniques, dredging on the river banks, removing vast areas of floodplain and riparian vegetation using heavy bulldozers and machinery to expose potential diamond-yielding gravel deposits. These operations have resulted in the significant clearing of trees and other vegetation. Clearing of such vegetation directly contributes to rapid loss of soil moisture, bank erosion and topsoil loss. As the trees trap carbon

dioxide, therefore preventing it from being released into the atmosphere, the clearing will in future contribute to the atmospheric carbon dioxide imbalance.

As more vegetation is removed siltation of the river, deterioration of water quality and an overall decrease in biodiversity are noticeable. Increased sediment loads and reduced water flows have seriously affected habitats for indigenous fish populations and aquatic invertebrates in the Lower Vaal River. Many of these alluvial diamond mines operate illegally

and some within less than 5 m from the riparian vegetation or river banks.

Removed sediments, rock dumps, gravel and sand are stockpiled next to the river. When it rains, these sediments are washed into the waterway thereby contributing significantly to water turbidity. The dumps have increased the suspended solids concentrations that may result in hampered oxygenation of the river and the retardation of photosynthesis due to prevention of light and heat penetration. Accordingly,

water temperature drops and threatens the survival of aquatic organisms.

In some stretches of the river, especially in Windsorton, Rooipoort and Schmidts-drift areas, the river has been diverted to allow exploration of diamonds which has a negative impact on river health as a whole. After mining, the areas are most often than not left unrehabilitated and unrestored.

Relevant stakeholders must come together to stamp out illegal activities and rehabilitate and restore the riparian vegetation so that the river can continue providing the service it should. Water is a scarce commodity in South Africa, and communities should take ownership of rivers and contribute to the management of our freshwater ecosystems for the benefit of future generations. There is an urgent appeal to the public to report any illegal activities they come across. Even small contributions, such as removing rubble out of these systems, could greatly contribute towards our future water security. Let's work together to secure our own health.

• Report by Peter Ramollo, Aquatic Scientist with the Department of Environment and Nature Conservation, Northern Cape.



## Intensified efforts to improve regional groundwater management

With a view to improving development and management of groundwater in the region, the Southern African Development Community (SADC) is developing several tools to empower persons and organisations involved in the management of groundwater in southern Africa.

Groundwater is likely to play an even greater role for human development under changing climatic conditions hence the need for the resource to be well protected, and properly managed as a measure to mitigate climate change effects. The tools being developed by the SADC Water Division through the Groundwater and Drought Management Project will also assist in raising the profile of groundwater.

The tools include groundwater management plans for communities, maps that will give visual representation of the vulnerability of groundwater and the location of groundwater-dependent ecosystems in the region.

All groundwater resources are vulnerable to various degrees, hence the groundwater vulnerability maps will assist in guiding planners and resource managers in determining which areas are more susceptible to groundwater contamination. Groundwater-dependent ecosystems are vital yet poorly understood components of the natural environment. Typical examples of these systems are springs and wetland ecosystems where groundwater seeps to soil surface occur. In these systems groundwater contributes to water and nutrients which maintain a rich and unique biodiversity adjusted to these special conditions.

Methodologies on how to assist member states to establish the economic value of groundwater are also being developed. All these tools and methodologies will inform decision making and thus assist decision makers in the proper management, policy analysis and development of groundwater resources.

## Giving sanitation services franchising a go in the Eastern Cape

An innovative programme whereby emergent micro-entrepreneurs are trained and mentored to provide routine cleaning and maintenance services of sanitation facilities at schools is being tested and evaluated at the Butterworth district schools, in the Eastern Cape.

The programme uses concepts formulated and developed by the CSIR in collaboration with the Water Research Commission, and is based on partnerships. According to CSIR's Dr Kevin Wall, these involve skills development and incentive principles similar to those of franchising.

"We set out to facilitate the creation of emergent micro-businesses to undertake cleaning and maintenance

services of small-scale water and sanitation facilities – such as those owned by schools, clinics and municipalities," he explained. "The franchising concept was not entirely foreign to the people with whom we engaged – they have all patronised franchises such as food outlets and petrol stations."

The franchisor in this instance – Amanz'abantu Services – is an East London-based service provider with many years' experience of working alongside rural and developing communities. "Under the guidance of the franchisor, trainee franchisees were equipped to start cleaning and maintenance of the sanitation facilities at the schools," noted Dr Wall.

## Protect wetlands, create jobs



By protecting its wetlands, South Africa will not only be able to conserve its natural resources, but will also create many job opportunities.

This is according to Deputy Minister of Water & Environmental Affairs, Rejoice Mabudafhasi.

Speaking during a visit to Verlorenvlei, a wetland on the West Coast near Elandsbaai, in celebration of World Wetlands Day on 2 February, the minister singled out government's Working for Water and Working for Wetlands programmes, who had provided work to thousands of people while helping to conserve the country's natural resources.

According to Mabudafhasi, involving especially rural communities in wetlands' preservation was very important. "People in rural areas are best placed to understand how wetlands work and how to protect them and take advantage of the economic opportunities that these water bodies provide." South Africa has around 115 000 wetlands, covering over 4 million ha or 4% of the country's total surface area.

The programme establishes and supports local franchisee micro-businesses, thus creating entrepreneur and employment opportunities – mostly for women, as it turns out. The cleaning and maintenance services provided by the franchisees at schools are being paid for by the schools from their budgets

Mabudafhasi said that it was significant that World Wetlands Day was celebrated on the same day as the unbanning of the ANC and other political parties by former President FW de Klerk 21 years ago. However, she questioned whether the world was now freeing the environment as political parties had been freed and pointed out that the country's wetlands faced many challenges, most notably threats from urbanisation and mining.

Verlorenvlei is one of the largest inland bodies of water on the West Coast, and one of 20 wetlands designated as Wetlands of International Importance under the Ramsar Convention on Wetlands. The 1 500 ha vlei hosts at least 75 resident and migratory bird species. In recent years the wetland has come under severe pressure from, among others, agricultural activities and alien vegetation in the upper catchment.

Rehabilitation of the wetland under the Working for Wetlands programme started in 2006 and, to date, R5,2-million has been spent on improving Verlorenvlei, including clearing 140 ha of invasive alien vegetation.

annually allocated for operation and maintenance of infrastructure.

Irish Aid, Ireland's government department that assists developing countries, has committed to providing substantial research and development funding for the pilot for three years.

**Source: CSIR**

## City of Cape Town bags regional water demand management award

The City of Cape Town has become the first winner of the SADC Water Demand Management (WDM) Award.

The award was initiated by the SADC Water Demand Management Programme last year. This programme is being implemented by the Development Bank of Southern Africa (DBSA) with support from the Swedish International Development Cooperation Agency (Sida). In the photograph Thembisile Khosa, DBSA Agencies Unit Coordinator, is handing the prize over to Zolile Basholo and Donnavin Wright of the City of Cape Town.

The regional award is designed to recognise achievements of organisations who have worked towards improving understanding, awareness and implementation of WDM measures. These might include a range of interventions, i.e. changing the behaviour of consumers, disseminating water efficient technologies, introducing efficiency-inducing pricing structures, and reducing leakages in distribution networks, among others.

According to the DBSA, the award acknowledges the high standard, ongoing commitment,

actual implementation and sustainability of WDM initiatives undertaken by institutions and organisations, commercial and public alike. It highlights the measurable improvements in WDM initiatives. Furthermore, the award encourages organisations to strive for excellence in their daily work and continue to enhance their skills and experience in WDM.

"The City of Cape Town's holistic approach to WDM and water conservation (WC), through the implementation of a number of different WC/WDM projects, each with its own innovative elements, was a testimony to the City's commitment in addressing some of its water challenges," said the DBSA in a statement. "The projects implemented fulfil the criteria set out in both the water services development plan and the WC/WDM strategy."

To date, the City has undertaken numerous projects, including leaks repair, installation of water management devices and debt write-off, use of treated effluent, pressure management, as well as awareness and education for leaks repair projects.

Nominations for the 2010/11 Award are now open. Visit: [www.wdm-in-sadc.net](http://www.wdm-in-sadc.net) or Email: [info@wdm-in-sadc.net](mailto:info@wdm-in-sadc.net) for more information.



## First historic SA engineering landmark awarded

The Van Stadens Weir and Dam outside Port Elizabeth has become the first landmark to be declared a civil engineering works of historic significance by the South African Institution of Civil Engineering (SAICE).

The purpose of the awards is to publicise engineers and their achievements, and to encourage preservation of historic projects. According to SAICE, nominations are judged according to a range of criteria, among others, the works should generally still be in existence, should be over 100 years old, and should have made a notable contribution to the welfare and economy of a community.

Port Elizabeth had struggled with its water supply since its founding in 1820. After various attempts by private suppliers to serve the town from wells

and springs, the Town Council decided to develop a source on the Van Stadens River. A site for a weir was identified in 1877 and the scheme was officially opened in June 1881.

By 1890 it was apparent that a dam would be necessary to store water for those times when the flow of the river would be insufficient to meet the demand. South Africa's first consulting engineer, Thomas Stewart, was appointed to design the dam, intake and filtration plant, and to arrange to build the works. The complex was completed in 1893.

The entire scheme was one of the first major properly engineered water supply projects in South Africa and the dam is one of the first major such constructions in the country.

**Source: SAICE**

## Organisation calls for protection of 'no-go' mining areas

The World Wide Fund for Nature (WWF South Africa), together with numerous South African non-governmental organisations and the Centre for Environmental Rights, has handed over a list of areas to the Minister of Mineral Resources, Susan Shabangu, to be declared 'no-go mining zones'.

The list is aimed at assisting the minister in exercising her discretion under section 49 of the Minerals and Petroleum Resources Development Act, 2002, which seeks to prohibit or restrict granting reconnaissance, prospecting and mining rights and permits. "This proposal will enable the minister to prevent mining and prospecting in certain areas of critical biodiversity, heritage and hydrological importance," explained Mark Botha, Head of Biodiversity at WWF.

The proposed areas include, among others, national parks or nature reserves, marine protected areas, mountain catchment areas (such as the Amatholes

in the Eastern Cape), and Ramsar sites, including Barberspan near Delareyville, the Verlorenvlei north of Lamberts Bay, Kosi Bay and the Turtle Beaches of Tongoland in northern KwaZulu-Natal.

"These areas are key for our survival. They nurture one of the most amazing natural heritages in the world and support the bulk of our ecological infrastructure for water provisioning and filtering," said Botha. "What people tend not to realise is that such areas are the basis for a growing and sustainable economy. They provide agricultural with free basic inputs."

"We are asking that areas of key water catchments, groundwater recharge and ecosystems recognised as threatened or sensitive should be conserved. Cultural heritage sites identified by national or provincial heritage agencies also need protection," noted Botha.

**Source: WWF**

## JW expanding Olifantsvlei sewage works

Johannesburg Water (JW) has embarked on a multimillion Rand project to increase the capacity of the Olifantsvlei Wastewater Treatment Works, one of the six treatment works operated and maintained by the utility.

The extension and completion of this project will see an increased capacity from 200 ML/day to 250 ML/day average dry weather flow which will help cope with future growth in the Olifantsvlei catchment in the south of Johannesburg, said the utility in a statement. The construction phase of the project has started and anticipated completion date for the civil, mechanical and electrical contracts is the end of April 2012.

The appointed contractors will be required to make every effort to give first preference to local communities when employing staff to work on the project. Furthermore, accredited training will be provided to technical staff from historically disadvantaged groups in line with JW's empowerment and upliftment initiatives.

## Record shattered at De Hoop

Impoundment of De Hoop Dam is set for April 2011.

This is after the Department of Water Affairs construction team shattered the national record for placement of concrete.

A total of 103 600 m<sup>3</sup> of concrete was placed in 23 days – more than double the previous record of 40 600 m<sup>3</sup> which was placed in one month at Wolwedans Dam in the Southern Cape. The latter dam supplies water to Mossel Bay.

The concrete was placed between November 4 and 27, with a peak hourly production of 329 m<sup>3</sup>. The African record for concrete placed in one month is 175 000 m<sup>3</sup>. De Hoop Dam is being constructed using a special roller-compacted concrete mix.

## New SAICE president calls for ethical leadership

New President of the South African Institution of Civil Engineering (SAICE) has called for engineers to lead with integrity.

Reading out loud his 'Credo for the African Engineer' Mathetha asserted that "just like doctors have the Hippocratic Oath to guide their actions to provide medicine to the sick, engineers should have a credo which would guide them in providing the fundamentals of human life, such as clean water, access to sanitation, roads and so on, in an ethical and moral manner." He expressed the hope that his credo would be embraced with enthusiasm by South African as well as fellow African engineers to be used as a tool towards achieving moral and ethical behaviour at all times.

"Universities are instrumental in creating the highest knowledge, expertise and innovation. Universities must also ensure that knowledge and expertise promote the welfare, culture and sustainable development of the surrounding society. However, adhering to ethical principles becomes increasingly difficult when faced with the realities of the working environment. It is in this area that learned societies such as SAICE, can make a huge contribution by providing the impetus for morality and sustainability through the introduction of a credo," stated Makhetha.

SAICE has embarked on an anti-corruption campaign to enhance moral and ethical conduct among the profession. "Engineers are faced with finding a fine balance between development and sustainability. It is an ethical choice [for engineers] to provide an enabling solution which would allow people to acquire and maintain a sustainable and balanced lifestyle," noted Makhetha.



### Water diary

#### NANOTECHNOLOGY MAY 15-18

The IWA Applications of Nanotechnology in the Water Sector 2011 will take place in Monte Verita, Switzerland. This conference will bring together leading scientists from different research fields to discuss and push forward the most promising applications of nanotechnology in the water and wastewater industry. *Enquiries: Ralf Kaegi; Tel: +41 (0) 44 823-5273; Email: ralf.kaegi@eawag.ch; www.iwanano2011.org*

#### POLYMERS MAY 22-25

The 11th International Conference on Frontiers of Polymers and Advanced Materials will take place at the University of Pretoria's Conference Centre. *Email: conference@icfpam.ac.za or Visit: www.icfpam.co.za*

#### WATER TECHNOLOGY JUNE 6-10

The 8th IWA Leading-Edge Conference on Water and Wastewater Technologies will take place in Amsterdam, the Netherlands. The conference focuses specifically on

advances and development in water and wastewater technologies.

*Email: let2011@iwahq.org; Visit: www.let2011.org*

#### TRANSBOUNDARY WATER JUNE 8-9

The 3rd Orange River Basin Symposium is being hosted by the University of the Free State, Bloemfontein. Themes include, among others, environmental water requirements, water harvesting, changing environments, transboundary water issues, state of the Orange River, the role of water in food security and acid mine drainage. *Enquiries: Sanet Neethling; Tel: (051) 401-2863; Email: neethlingis@ufs.ac.za; Visit: www.ufs.ac.za/orangeriver*

#### HYDROLOGY SEPTEMBER 12-14

The 15th South African National Hydrology Symposia will take place at Rhodes University, Grahamstown. The theme of this year's conference is 'Science and Practice for Sustainable Water Resource Management'. *Visit: www.ru.ac.za/institutes/iwr/sanciahs*



## Removing willows saves water

Removing weeping willows growing in the streambed of rivers and streams could return valuable water resources to river systems, CSIRO research has found.

The study into the water use of willows found that potentially more than 5,5 ML/year of water could be saved per hectare if willow canopy were removed where trees stood in-stream with permanent access to water.

“One megalitre is one million litres – the volume of water used by three average households a year. So the evaporative loss of one hectare of willows is enough for about 17 households each year,” said project leader Tanya Doody. “A comparative study of native vegetation use lining the same watercourse showed willows could be replaced with native vegetation and the annual water savings would be maintained.”

Funded by public company Water for Rivers, the project results have been published in the *Journal of Environmental Management*. According to Water for Rivers Project Director Phil Deamer, an estimated 220 ha of in-stream willows in rivers have been removed. “This removal has returned 1 200 ML/year of water that was previously lost to willows,” he said.

**Source: CSIRO**

## Electric nano-filter promises cleaner water for cheaper

American scientists are reporting development and successful initial tests of an inexpensive new filtering technology that kills up to 98% of disease-causing bacteria in water in seconds without clogging.

A report on the technology appears in *Nano Letters*, a monthly American Chemical Society journal.

Dr Yi Cui and colleagues from Stanford University, in California, explain that most water purifiers work by trapping bacteria in tiny pores of filter material. Pushing water through those filters requires electric pumps

and consumes a lot of energy. In addition, the filters can get clogged and must be changed periodically. The new material, in contrast, has relatively huge pores, which allow water to flow through easily. And it kills bacteria outright, rather than just trapping them.

The scientists knew that contact with silver and electricity can destroy bacteria, and decided to combine both approaches. They spread sub-microscopic silver nanowires onto cotton, and then added a coating of carbon nanotubes, which give the filter extra

electrical conductivity.

Tests of the material on *E. coli*-tainted water showed that the silver/electrified cotton killed up to 98% of the bacteria.

The filter material never clogged, and the water flowed through it very quickly without any need for a pump. “Such technology could dramatically lower the cost of a wide array of filtration technologies for water as well as food, air, and pharmaceuticals where the need to frequently replace filters is a large cost and difficult challenge,” their reports states.

**Source: American Chemical Society**

## Study establishes methods to assess recycled aquifer water

The Australian Government National Water Commission has funded a study to establish an approach to assess the quality of water treated using managed aquifer recharge.

Researchers at Australia’s CSIRO Land and Water set out to determine if the end product would meet standard drinking water guidelines.

At the Parafield Aquifer Storage, Transfer and Recovery research project in South Australia, the team of scientists harvested storm water from an urban environment, treated it in a constructed wetland, stored it in an aquifer, and then recovered the treated water via a well.

The stormwater exceeded the Australian drinking water guidelines prior to treatment. Small amounts of faecal bacteria, elevated concentrations of iron, and other contaminants were found in the water. After undergoing treatment, however, the water collected from the aquifer had dramatically lower levels of all hazards. Further supplemental treatment was needed to remove some hazards, though the process shows potential if improvements are made.

“Overall, results from the assessment showed that the water produced via this process was of near potable quality,” said Declan Page of CSIRO Land and Water. “This is the first reported study of a managed aquifer recharge scheme to be assessed following the Australian guidelines for a managed aquifer recharge.”

CSIRO Land and Water is continuing research in an effort to develop a sustainable method for recycling water through an aquifer.

**Source: American Society of Agronomy**





## 'The pill' not to blame for oestrogen in drinking water – Study

Contrary to popular belief, birth control pills have been found to account for less than 1% of the oestrogens found in the USA's drinking water supplies.

According to scientists of the Programme on Reproductive Health and the Environment at the University of California, San Francisco, this endocrine disrupter enters drinking water supplies mainly from other sources. Amber Wise, Kacie O'Brien and Tracey Woodruff note ongoing concern about possible links between chronic exposure to oestrogens in the water supply and fertility problems and other adverse human health effects. Almost 12 million women of reproductive age in the USA take the pill, and their urine contains the hormone. Hence, the belief that oral contraceptives are the major source of oestrogen in lakes, rivers and streams.

Knowing that sewage treatment plants remove virtually all of the main oestrogen – 17 alpha-athinylestradiol

(EE2) – in oral contraceptives, the scientists decided to pin down the main sources of oestrogen in water supplies. Their analysis found that EE2 has a lower predicted concentration in USA drinking water than natural oestrogens from soy and dairy products and animal waste used untreated as a farm fertiliser. And that all humans (men, women and children, and especially pregnant women) excrete hormones in their urine, not just women taking oral contraceptives.

Some research cited in the report suggests that animal manure accounts for 90% of oestrogens in the environment. Other research estimates that if just 1% of the oestrogens in livestock waste reached waterways, it would comprise 15% of the oestrogens in the world's water supply.

To access the report, 'Are Oral Contraceptives a Significant Contributor to the Estrogenicity of Drinking Water', Visit: [http://coe.ucsf.edu/coe/spotlight/env\\_hlth+wm/contraceptives\\_water.pdf](http://coe.ucsf.edu/coe/spotlight/env_hlth+wm/contraceptives_water.pdf).

## Massive *Daphnia* genome leads to understanding gene-environment interactions

An international team of researchers, the *Daphnia* Genomics Consortium, has described the complete genome of *Daphnia pulex* (the water flea), opening the door to enhanced knowledge of this species and its response to the environment.

The team found that, despite its near-microscopic size, the humble *Daphnia* contains more than 31 000 genes, more than any other animal with a complete gene sequence, including humans. The findings have been detailed in an article in the journal *Science*.

"It's personally a major achievement,"

said W Kelly Thomas, Hubbard Professor in Genomics and Director of the University of New Hampshire's Hubbard Centre for Genome Studies. "This genome gives biologists and ecologists the tools they need to do genomic analysis on this organism from an ecological perspective."

The end product is a better understanding of what genes matter for organisms to cope with environmental stresses like pollutants and global warming and of the technologies necessary to understand how these genes function within an animal that is easily studied in water reservoirs around the globe.

## Victory for Kalahari Bushmen as court ruling grants water rights

Botswana's Court of Appeal has squashed a previous ruling that denied the Kalahari Bushmen access to water on their ancestral lands.

With support from international organisation, Survival, the Bushmen appealed a 2010 High Court judgement that prevented them from accessing a well they relied on for water. Among others, the panel of five Appeal Court judges found that the Bushmen have the right to use their old borehole, which the government had banned them from using; that they have the right to sink new boreholes and that the government's conduct towards them amounted to 'degrading treatment'.

In 2002, the Bushmen were forcibly evicted from their ancestral lands in the Central Kalahari Game Reserve by the

Botswana government. They took the government to court and after four years, won a landmark ruling that said they had been evicted illegally and unconstitutionally, and that they have the right to live on their ancestral lands.

However, since then, the government has continued to prevent the Bushmen from returning home, by banning them from accessing a well which it capped during the evictions. Despite the lack of water, many Bushmen have returned to their homes, surviving off rainwater and melons, and making arduous journeys by foot or donkey to fetch water from outside the reserve.

More court action followed and a 2010 ruling was made in favour of the government. This has now been overturned by unanimous decision of five Appeal Court judges.



Arguably, more is known about the ecology and stress biology of the water flea than any other animal. The genome project was conceived with an expectation that many new gene functions would be uncovered when studied in light of the animal's natural environment – not necessarily expecting to discover many more genes.

Yet, *Daphnia's* genome is no ordinary genome, it turns out. "*Daphnia's* high gene number is largely because its genes are multiplying, by creating copies at a

higher rate than other species," explained project leader John Colbourne. "We estimate a rate that is three times greater than those of other invertebrates and 30% greater than that of humans."

According to Colbourne, one theory is that *Daphnia* is so good at adapting to so many environments because it has this huge catalogue of genes to call upon. The researchers note that more than a third of *Daphnia's* genes are undocumented in any other organism – they are completely new to science.



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# MEMBRANE TECHNOLOGY conference 2011

1on1 Gateway, Umhlanga,  
11 - 14 September



*Following the success of the first international conference, the WISA Membrane Technology Division is proud to announce that it will host a 2nd International WISA Membrane Technology Conference in KwaZulu-Natal. The organizing committee invites you to register and submit your abstracts.*

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## New urinal valve saves water



The growing precariousness of South Africa's water situation is prompting the need for waterless systems of all kinds, including waterless sewage and urinal disposal systems.

One such system currently being introduced to the market by Sannitree is the Free Flowing Water Free Urinal Valve (patent pending). According to Sannitree founder Mike Mayne (pictured with the company's John Williams), the new valve is a breakthrough invention because it not only drastically reduces the use (and cost) of water, but it is also far more hygienic than conventional systems.

The traditional men's urinal found in today's hotels, restaurants, office complexes and sport clubs has a U-bend below the bowl. This can and does keep within the system the odours and gases that are generated by urine when it is mixed with water impurities. Long experience, however, has shown that the U-bend is by no means 100% effective in this respect. This technology does go out of order, leaving permanent, unpleasant odours and gases in the atmosphere. Furthermore,

traditional urinals are exceptionally wasteful of water – every time they are flushed they use up to two litres of water.

In his search for a solution, Mayne hunted for a local manufacturer that could design and supply a one-way waterless valve for urinals. The final design features an airtight seal and a deodorising dome which, it has been shown, entirely eliminates the need for water while efficiently containing the entrapped odours and gases. The patent for the system is now pending.

Tests have proven that the unit is also capable of dealing with the traditional problems experienced by flushing urinals. These include encrustation and blockages (which can cause flooding). "In an efficient, water-free urinal bacteria cannot thrive because they need moisture to reproduce," notes Mayne.

The new design will fit 95% of all urinals, and can be installed by an unskilled worker. It is also easily cleaned. "The new system can save 1,5 million litres of water every year in a single-rise building," notes Mayne.

## SA's largest desal plant supplied in record time



The largest seawater desalination plant in South Africa is now operational.

The 15 Ml/day plant, situated at Mossel Bay, is supplying water to Mossel Bay Municipality and PetroSA. The turnkey project was undertaken by Veolia Water Solutions and Technologies within 6 months.

In an earlier undertaking to alleviate the water crisis, Veolia constructed a municipal wastewater reuse plant for the municipality to supply PetroSA with purified water recovered from domestic sewage. The aim of this plant was to relieve the pressure on the municipal supply. It is one of several emergency projects launched to address the problem of water supply in the district.

The seawater desalination plant, located on PetroSA's logistics site at Voorbaai, is supplied directly by open seawater intake, just off Seal Island, about 600 m out to sea from the bay itself. The seawater is pumped to a pump station, and then into a holding

tank via drum screens, which screen incoming water to 500 microns in an effort to get rid of kelp, sea shells and other impurities.

Next, water passes through six filters before going to the reverse osmosis units for purification. The treated water is fed from the plant into split tanks. A dedicated tank of 5 Ml supplies PetroSA. The 10 Ml of water destined for human use in the other tanks is treated chemically to kill any bacteria and stabilise the pH balance before joining up with the municipal water line.

The project team faced various challenges in terms of ground space. The project also required Veolia to build its largest pressure water filters to date. In addition, time constraints warranted several special logistical arrangements for those parts that had to be imported. Last, but not least, there were environmental considerations to take account of.

The plant became operational at the end of January.

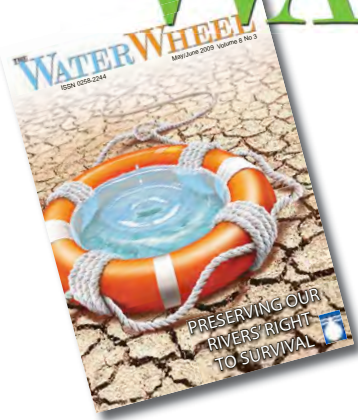


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## New from the WRC

### Report No: KV 234/09

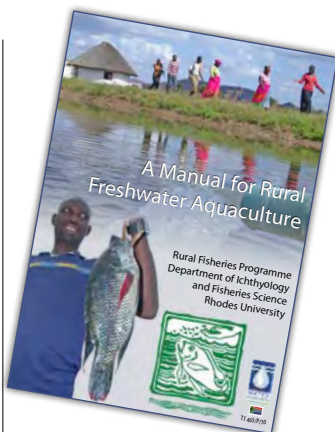
*WRC Programme on Endocrine Disrupting Compounds (EDCs) Volume 4: Implementation of the Extended Research Plan on Endocrine Disruptor Chemicals in Water Resources (AEC Burger)*

The WRC launched the EDC Research Programme to coordinate local research undertaken on this subject and also to involve other role-players such as government departments, industry and water suppliers in the research. This report is the last of a series, and reports on the implementation of the extended research plan as recommended in a previous volume. It gives an overview of the status of projects from 2006-2010 and recommendations for future research and actions to be taken in the WRC EDC Research Programme. The other reports in this series are: *Volume 1: Strategic Research Plan for EDCs in South African Water Systems (Report No: KV 143/05)*; *Volume 2: Implementation of a Research Programme for Investigating EDCs in South African Water Systems (Report No: 1402/1/08)*; and *Volume 3: Extended Plan for the EDC Research Programme of the WRC 2006-2010 (Report No: KV 228/09)*.

### Report No: TT 463/P/10

*A Manual for Rural Freshwater Aquaculture (Rhodes University)*

In 2004, the Rural Fisheries Programme of the Department of Ichthyology and Fisheries Science, Rhodes University, completed a project on behalf of the WRC to assess the contributions of rural aquaculture to livelihoods. It became apparent that although the current contributions



were low, the potential was significant. To exploit this potential a new project was solicited by the WRC in 2005 and is co-funded by the Department of Agriculture, Forestry and Fisheries (DAFF). This project was formulated to address a number of issues, such as developing provincial aquaculture strategic plans, revitalising State hatcheries, training of extension officers and the development of a manual to complement the training. It is envisaged that this manual will continue to be modified and reviewed as aquaculture in South Africa grows in order to reflect the needs of the extension officers over time. The manual is not only intended for the training of extension officers, but is also resource material to be used in the field when interacting with farmers.

### Report No: 1891/1/10

*Laboratory and Pilot-scale Development of the Ambient Temperature Ferrite Process (NE Ristow & AR Brauer)*

This project was commissioned in response to an opportunity to implement the ambient temperature ferrite process

(ATFP) as part of the CSIR Alkali-Calcium Desalination Process that was to be installed at the East Rand Proprietary Mines (ERPM) site in Germiston, Gauteng, treating 100 M<sup>3</sup>/day of acid mine drainage. The ATFP was developed previously at pilot scale, but the results were negative in terms of iron removal, and the development was continued at laboratory scale. Once the ERPM opportunity had been identified, it was agreed that the process development should be fast-tracked so that the ATFP could be included as part of the AMD treatment process.

### Report No: KV 252/10

*Rapid Enzymatic Detection of Organochlorine Pesticides in Water (B Pletschke; I Cockburn; P Adebisi & JS van Dyk)*

In recent years, increased public awareness and interest in environmental issues have highlighted the problem and the effects of the high level of accumulated persistent pesticides and other toxins in the environment. The increased concern and attention around this issue has led to an increased need for effective methods of detection of these substances in potentially contaminated areas and systems. The ultimate aim of this work was to develop a rapid enzymatic assay for the detection of organochlorine pesticides.

### Report No: 1831/1/10

*A Systematic Approach to Sulphidic Waste Rock and Tailings Management to Minimise Acid Rock Drainage Formation (S Harrison; J Broadhurst; R van Hille; O Oyekola; C Bryan; A Hesketh; A Opitz)*

Acid rock drainage (ARD) is recognised as a major challenge to South Africa. Re-examination of the manner in which waste materials are disposed from the mineral processing and extractions stages of mineral recovery is required to relieve the environmental burden created and reduce the timeframe of risk. In this study, the approaches to the removal of risk through removal of sulphur species were considered through both a paper-based review of key South African workings and a set of case studies addressing specific mineral wastes. Aspects of disposal of dump rock and tailings from mining operations processing mineral sulphides (especially pyrite) have been addressed, specifically with the focus of reducing capacity to form ARD through removal of the sulphidic component of the waste.

### Report No 1670/1/10

*Strategic Guidance towards Prioritising Stormwater Management Research in Human Settlements (J Burke & X Meyer)*

The WRC identified the need to determine and prioritise stormwater research needs, particularly in the field of stormwater control and management. The objectives of this study were to build on the outcome of a previous project and further identify, characterise and prioritise stormwater management issues requiring attention in South Africa, within the context of human settlements. Among others, findings indicated that resources and support from the political level were limiting factors in proper stormwater management.

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# WATER USE EFFICIENCY – Irrigators take the lead in Lower Olifants



Lani van Vuuren

*The canal at Ebenhaeser settlement at the lower end of the Lower Olifants River scheme.*

*Despite the challenges associated with operating an 80-year-old irrigation scheme, the Lower Olifants River Water User Association (LORWUA) is successfully supporting one of the most important agricultural areas in the country while continuously striving for water use efficiency. Lani van Vuuren reports.*

Modernisation of farming has taken place in the Olifants River Catchment, in the Western Cape, since the arrival of Dutch settlers in the 1600s. Farmers initially planted crops in the fine alluvial deposits on the banks of the river. The first dam (Bulshoek) and associated canals were constructed just after the First World War. This was followed by the construction, through labour-intensive methods, of the Clanwilliam

Dam and additional open canals in the 1930s (for more information on the history of the scheme, see *Water Wheel*, September/October, 2010).

Today, the scheme comprises the Bulshoek and Clanwilliam dams, as well as a main canal split into a left bank canal of 136 km and a right bank canal of 123 km. A total of 1 052 sluices are used to draw off water for a scheduled area of 9 510 ha.

Apart from a betterment scheme in the 1960s which saw the canals

being lined with concrete, the canal system has had no major refurbishment. Yet this antiquated system is hardly obsolete. The semi-arid region receives only about 152 mm of rain per year, and without the system irrigated agriculture would be impossible. Irrigated agriculture is by far the largest employer here, and the Lower Olifants scheme supports a burgeoning wine and table grape sector, supplemented by other produce such as tomatoes, vegetables, deciduous fruits and citrus. Apart from commercial farmers, the canal system also feeds an emerging farming community at Ebenhaeser, agriculture-related industry as well as seven small towns dotted along the West Coast.

**“WAS provides improved control of water orders (both current and historic), while the record of monthly accounts and reports that can be generated using the system are irreplaceable.”**

“The region is about 90% dependent on agriculture and its associated industries,” reports LORWUA CEO Johan Matthee. “If irrigators are having a tough time and their buying power recedes, the effect can be felt by town businesses almost immediately. The sector also generates a considerable income for the State. Excise duties from the Lower Olifants Valley alone totals around R480-million a year.”

## MANAGING WATER DEMAND

LORWUA was the first water user association to become operative in South Africa following the promulgation of the National Water Act in 1998, and has been operational since 2001. The scheme is subdivided into eight sub-districts or wards managed by seven water control officers. Each water control officer serves around 150 clients.

The Lower Olifants River scheme is among a growing number of schemes benefiting from the

international award-winning Water Administration System (WAS). The system, developed by Dr Nico Benadé with funding from the Water Research Commission (WRC) enables accurate and real-time collection of data regarding water levels, volumes and abstractions, and overall, has assisted irrigation schemes to realise huge improvements in water losses. Nationally, the system saves irrigation schemes more than 85 million m<sup>3</sup> (21%) of water.

At LORWUA, irrigators request their water through strategically placed post boxes dotted across the scheme. Water allocation periods run from Mondays 06:00 to 06:00 the following Monday. The Lower

they use have been adapted for this purpose. The schemes also operates on a ‘rolbeurt’ (revolving chance) system, which means that farmers are not allowed to order water with the same starting day every week. This is done to ensure the maximum volume of water is placed in the canal without exceeding the maximum abstraction right.

LORWUA has a number of computers linked to a network, which means that the water orders can be captured on WAS simultaneously and in a short time period. Matthee reports that the WAS plays an enormously important role at the scheme. “WAS provides improved control of water orders (both current and historic), while the record of monthly accounts and reports that can be generated using the system are irreplaceable.”

Cancellations and additional water requests need to be done 72 hours in advance. The scheme has 30 water control aids who patrol the scheme (each one being responsible for a 6-10 km section) on bicycle and open and close sluices three times a day. Strict rules apply to water users on the scheme. No interference with sluices or the system is allowed.

*The 127-million m<sup>3</sup> Clanwilliam Dam is the main supplier of water to the Lower Olifants River scheme.*



Lani van Vuuren



Lani van Vuuren

**Above:** Most water losses are occurring as a result of the bad state of the concrete in the canal.

**Below:** Strandfontein is one of six little towns dependent on water from the Lower Olifants River scheme.

Those found taking more than their share can have their sluices painted red for all to see (name and shame).

Measuring the water that goes into the system is an extremely important part of the management of such an irrigation scheme. LORWUA has placed additional measuring stations at the start and end of each sub-district with the associated telemetry. V-notches have been installed, and more improvements are planned for the future.

According to Matthee, the greatest challenge on the scheme is ensuring that each irrigator or water user receives fair share of water on time. “The scheme is over-scheduled and the canal is physically too small to transport all the water required. In addition, the capacity of the Clanwilliam Dam is inefficient to meet the water requirements of the scheduled area.” While the yearly quota is 12 200 m<sup>3</sup>/ha, the limited capacity of the canal allows for a maximum extraction rate of 325 m<sup>3</sup>/ha each

week. Between October and middle-May (the water year) the scheme is only able to supply 8 200 m<sup>3</sup>/ha.

Raising of the Clanwilliam Dam by 13 m is on the cards. This will increase the water supplied from the dam by 70 million m<sup>3</sup>/year. However, this will require raising and strengthening the canal system. “Practically, it will be a real challenge supplying water and undertaking canal improvements at the same time,” says Matthee. The feasibility of this R1,8-billion project, which will have to be undertaken simultaneously with the raising of the dam, is currently being investigated by the departments of agriculture and water affairs.

**“If irrigators are having a tough time and their buying power recedes, the effect can be felt by town businesses almost immediately.”**

Meanwhile the current limitations of the scheme have caused irrigators themselves to become more water efficient. Flood irrigation has largely been replaced by drip irrigation, especially since the drought year experienced in 2003/04. This has resulted in substantial water savings per hectare.

## CHALLENGES TO THE OPERATION

Despite these challenges the water user association has managed to reduce water losses from 48% (in 2002) to 24%. When one considers that the average losses on open canal systems are between 40% and 50%, this is an extremely good number. Water is now mainly lost to breakages and leaks in the system. Evaporation out of the canals caused by hot temperatures and winds also contributes to water losses.

LORWUA has gone out of its way to ensure that not a drop of water on the scheme is wasted unnecessarily. An evaluation of the state of



Lani van Vuuren



infrastructure in 2003 highlighted areas in need of most urgent attention. Since 2002 the water user association has spent around R3,5-million each year to improve the state of concrete canals. This work is considerable when one realises that only 11 weeks of the year can be set aside for maintenance.

Last year the water user association did major repair work to the concrete in two high-risk sections of the canal (13 km in total) at a total cost of R11-million. "This summer we are reaping the benefits of this improvement, however, no water user association can afford to finance these kinds of repairs on a regular basis themselves," notes Matthee.

The scheme's siphons are also receiving attention. In 2009, LORWUA, with financial assistance from the Department of Water Affairs, replaced the largest siphon on the scheme (2,1 m diameter) at a cost of R24-million. A further five siphons need to be replaced and funding is being sought in this regard.

Unfortunately the Lower Olifants River scheme suffered a major setback in December. On 15 December 170 mm of rain fell within 24 hours between Lutzville and Koekenaap (The rest of the scheme received about 70 mm of rain). Despite LORWUA's efforts the resultant floods caused great damage to the canal infrastructure amounting to R2,5-million. Stormwater and sediment resulted in canal breakages at five sites, while large parts of the canal became blocked due to sediment and debris. Heavy machinery, including diggers, loaders and dump trucks, along with 80 workers, cleared the canals, and pumps were used to supply water to users at the lower end of the scheme. The mopping up exercise lasted until 31 December.

Despite these setbacks the Lower Olifants River scheme remains an important example of effective water management to achieve water savings in the irrigation sector. □



Lani van Vuuren

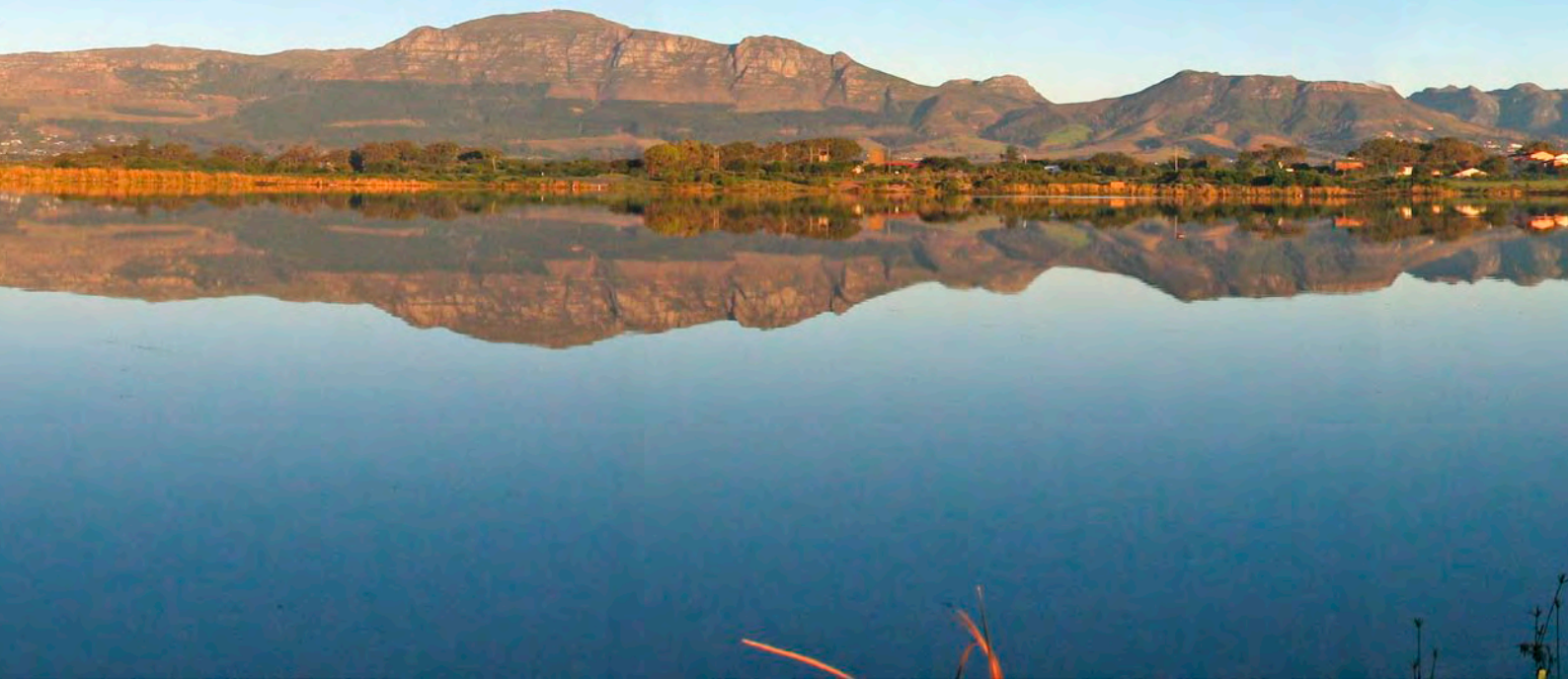
*Many farmers make use of balancing dams (so-called 'oornag damme') to tie them over between water orders.*



Lani van Vuuren

*Today, the Lower Olifants River is known for its vineyards. Most farmers have replaced flood irrigation with drip irrigation techniques to save water.*

# PRINCESSVLEI – Tug of war



## *It is Development versus Conservation as the sides square up to decide the fate of Princessvlei in the Western Cape.*

*Petro Kotzé investigates.*

Once, around 1510, a Khoisan princess of the Gorachouqua people lived in Elephant Eye cave on Constantiaberg, Cape Town. While swimming in a nearby vlei, she was abducted, some say murdered, by Portuguese sailors from the ship of Francesco d'Almeida. Folklore has it that her tears formed Princessvlei, and in retribution, it is said that one person drowns here each year. Centuries later, the controversy around this wetland has not abated.

Princessvlei is situated in the Retreat area in the Cape Flats, and is classified as a Sand Fynbos depression linked to a channel (the Diep/Sand river system), surrounded by floodplain flats (the vegetated areas around the margins). This small, shallow wetland (29 ha) was once linked to Little Princessvlei and the Diep River, but the Little Princessvlei is no longer in the same catchment.

For decades, Princessvlei has served as a recreational area and baptism site for the local community.

During apartheid, the northern shore was nicknamed Claremont beach, as many of the City's recreational areas were declared off-limits to displaced communities. Today, the wetland is severely degraded, mostly due to intensive urban development in the surrounding area. Consequently, it has been considered of low conservation value.

In 1998, Insight Property Developers set their sights on the property and approached the City of Cape Town with an unsolicited proposal to purchase the land. The plan was to build a regional shopping centre on a portion of the wetland and, 13 years later, the process simmers on. The proposed complex, earmarked for the eastern side of the wetland, entails a single-storey building with a footprint of about 9 080 m<sup>2</sup>, including 520 parking bays. Perks include a restaurant, coffee shops, retail outlets and a 30 m-wide open-space (the buffer area) measured from the edge of the water, serving as a secure and maintained public open space.

The property in question, a portion of Erf 82176 (which is currently valued at R4-million) is zoned as Public Open Space, and is owned by City Parks. The direct sale to the

developer was approved subject to the outcome of a Public Participation Process, Environmental Impact Assessment (EIA), the rezoning of the property and agreement to certain conditions of sale as well as a purchase price.

The property thus had to firstly be subdivided to separate the shopping centre portion from the rest of the property, and secondly, rezoned from Public Open Space to a business zone to allow for the shopping centre to be built. In 2002, Insight submitted and advertised the rezoning application.

In 2005, the Provincial Department of Environmental Affairs and Development Planning (DEA&DP) issued a Record of Decision (RoD) in terms of the Environmental Conservation Act of 1989. Valid for four years, this RoD is considered an Environmental Authorisation in terms of EIA Regulations promulgated under the South African National Environmental Management Act (NEMA).

The many conditions of this authorisation included that all alien vegetation (including aquatic) in and around the whole vlei must be systematically removed. The applicant must also establish an active

# over Cape Flats wetland continues



WESSA

environmental management committee to monitor and give input on all environmental decisions. Furthermore, all indigenous vegetation and topsoil must be removed from the areas proposed for the activity, stockpiled and used for the re-vegetation of disturbed areas.

The RoD was largely motivated by the Princessvlei and Little Princessvlei Restoration and Conservation study, concluded in 2002. The study aimed to assess the biophysical issues in the area and included floral, faunal, geohydrological, aquatic-ecosystem and land-use assessments. Among others, the faunal diversity was found to have deteriorated, and the vleis found to be affected by eutrophication, sediment accumulation and reduced biodiversity. The study found that the area in question was indeed degraded, not environmentally sensitive and considered of low conservation worthiness.

Hence, it was concluded that the proposed development would result in a socio-economic boost for the region, providing opportunities to, among others, improve the usage of the park and promote environmental education. In a nutshell, the development was seen as a good way to achieve a balance between

social-economic, environmental and cultural heritage sustainable practices.

## A TWIST IN THE TALE

In the meantime, parallel to this process, the Biodiversity Network Study was taking place. Covering the entire Cape Metropolitan area, the network aims to evaluate all remaining natural vegetation fragments and establish the minimum viable set needed to secure Cape

Town's biodiversity. The latest 2008 version is Cape Town's fine-scale conservation plan that represents the minimum set of remnants required to meet national and local terrestrial conservation targets. In addition, it includes all the natural wetlands, rivers and coastal ecosystems. Notably, it is a major informant in the City's Environmental Frameworks and Spatial Development plans.

During the time that the Princessvlei development has been under

*Armed with pitch forks, gloves and spades an enthusiastic 'Do it Day' group last year tackled alien vegetation along Princessvlei (including Port Jackson and Patterson's Curse), picked up litter and planted Suurvy. These activities contribute towards the Dressing of the Princess initiative, an effort to restore Princessvlei to its original beauty.*



WESSA

*The Princessvlei wetland in Cape Town is the current subject of a tug of war between developers and conservationists.*



consideration, this study was not available to influence the proposal, but this changed drastically after 2008. Princessvlei was shown to be anything but an erf with low conservation value. It is, in fact, quite critical.

The study showed that two vegetation types are present at the vlei, Cape Flats Dune Strandveld along the western and northern shores and Cape Flats Sand Fynbos on the eastern shore are respectively listed nationally as Endangered and Critically Endangered. The 2002 study did not select the eastern shore of Princessvlei as a viable site due to the poor condition of the vegetation and the historical disturbance that the site has been subjected to. The

2008 study maintains that, where Critically Endangered vegetation types are concerned, all sites must be conserved, as insufficient remnant area remains to meet national conservation targets. This includes even degraded sites where restoration potential exists.

Secondly, it was now established that the eastern shore of Princessvlei forms an important linkage for ecological processes that support the larger natural open space area. Although the vegetation is in poor condition, it forms an 'irreplaceable consolidation' area in support of the adjacent wetland and strandveld vegetation. The western and southern sections of Princessvlei are

also represented on the Biodiversity Network, as their ecological integrity is tied into the continuance of Erf 82176 as part of the Network.

According to Kate Snaddon of the Freshwater Consulting Group, the wetland was also given a CBA2 (Critical Biodiversity Area) rating after expert review due to, among others, the presence of the endangered Western Leopard Toad.

## PLANS FORGE AHEAD

With the rezoning approved in 2008, and the RoD in hand, the remaining hurdle was the subdivision of the property, said at the time to be merely "procedural". The City

of Cape Town was tasked with taking the decision on the sub-division. In spite of the inclusion of the site in the Biodiversity Network, in 2009, the City's Environmental Management Services recommended that the subdivision proceed, provided that the RoD be fully implemented and the developer initially pay R150 000, and then R80 000 per month into the Princessvlei Environmental Fund.

According to Cheryl Walters, the City's Director for Planning and Building Development Management, the sub-division was approved in 2009, on recommendation from the City's Spatial Planning, Environment and Land Use Management Committee (SPELUM). The conditions, though, were less stringent than the Environmental Management Services' recommendation. In the meantime, the RoD (valid for four years) and the rezoning approval (valid for two years) both lapsed in 2009, as no approved activities have commenced. Consequently, the city applied for an extension to both. This time, Walters says, when the extension to the rezoning application was advertised (simultaneously with the EIA extension of validity) the City received 241 objections and two petitions.

Graham Noble, of the Greater Cape Town Civic Alliance, one of the objectors, says that when the proposal was first advertised, residents surrounding Princessvlei were not aware of the wetland's significance. Furthermore, in their opinion, the RoD cannot be extended because the situation has changed. He is adamant that not only were the wetland's cultural significance not taken into consideration, but there are perfectly manageable rehabilitation options available.

This opinion is echoed by the Wildlife and Environment Society of South Africa (WESSA). Philippa Huntly, WESSA Senior Environmentalist (Western Cape Region) says that they object to the proposed development. They hold that the zoning of the land should revert to public open space, and that the concurrent application for the extension

period for the zoning should not be granted. "The area in question is one of the few areas of public open space for the adjacent community and is currently used as such. In addition it is a site of historical and cultural significance, and thus not a suitable site for a shopping centre." Furthermore, "the presence of a wetland is of concern environmentally as these threatened ecosystems provide crucial ecosystem services and biodiversity habitat."

## WHAT THE FUTURE HOLDS

Heidi Nieuwoudt, the Working for Wetlands Programme's Provincial Coordinator for the Western and Northern Cape explains that an ideal outcome for Princessvlei would entail minimal to no development close to the wetland. She adds that the wetland needs good, able, well-equipped management, which should include a manager and the development of a management plan. This plan should be the result of community input and should include the community's needs. Further positive outcomes would then be the rehabilitation and conservation of the Cape Flats Sand Fynbos.

However, according to Mandy Noffke, WESSA Conservation Projects Manager, complete restoration of the area will not be possible as the system is highly impacted and degraded by years of neglect and urban pressure. "However restoration of the endangered Cape Flats Sand Fynbos vegetation is certainly possible in parts of the Princessvlei area."

At the moment, affected parties will have to wait their turn to comment on the future of Princessvlei. Currently, explains Walters, the applicant has commented on the objections and petitions, but the Council's decision to extend the validity of the rezoning will only be taken once the RoD has been resolved. In the meantime, the City is finalising its comment on the extension to the RoD request. □

## PROTECTING SOUTH AFRICA'S WETLANDS

According to the International Association for Impact Assessment, EIA can be defined as "the process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of development proposals prior to major decisions being taken and commitments made."

In South Africa, the legislative framework for environmental governance is provided by NEMA. However, EIAs are still governed by regulations promulgated in terms of the Environmental Conservation Act of 1989. The EIA regulations require specific procedures, like scoping and/or EIA reports to be prepared for activities listed due to their potential to have substantial detrimental effect on the environment. The provincial government is usually the relevant authority for managing the EIA process.

The objectives of an EIA are:

- To ensure that environmental considerations are explicitly addressed and incorporated into the decision-making processes;
- To anticipate and avoid, minimise or offset the significant adverse biophysical, social and other relevant effects of development proposals;
- To protect the productivity and capacity of natural systems and the ecological processes that maintain their functions; and
- To promote development that is sustainable and optimises resource use and management opportunities.

Nieuwoudt maintains that in South Africa, the legal process benefits the ecosystem as it forces the developer to take it into consideration during the planning and development process. She is of the opinion that current legislation does offer sufficient protection to wetlands, even though some adjustments could be made. These include the distance and size of the buffer area surrounding the wetland (usually used as a measure within which development should not take place) as well as the definition of set-back lines.

Alternatives could be to rather use altitude as the measurement to indicate from where development can take place, instead of distance. She points out that climate change predictions indicate an increase in extreme floods, and that wetlands act as important buffer zones.

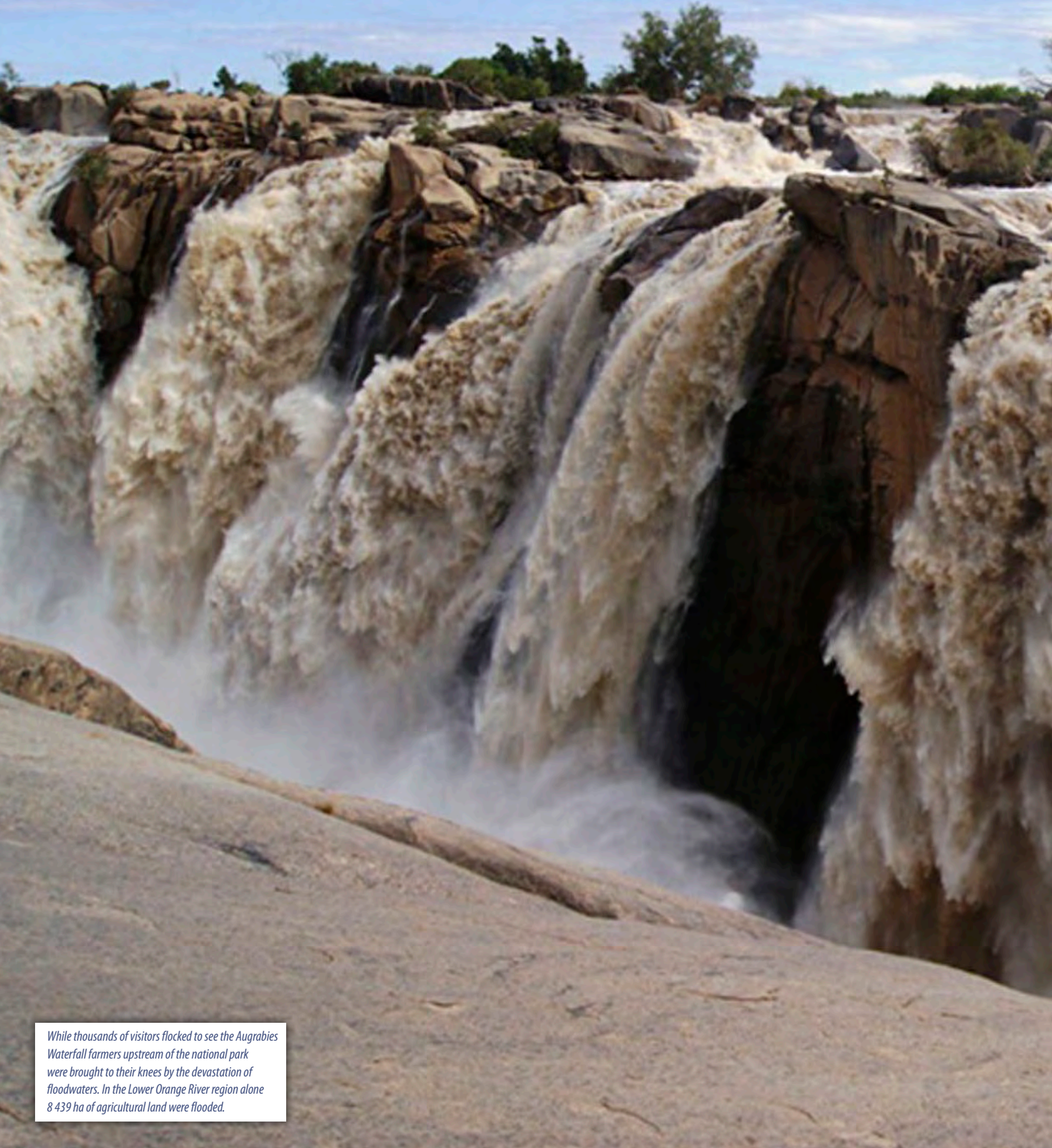
*Source: The Enviropaedia, edited by David Parry-Davis*

# SA mops up following floods

**I**t is a long road of recovery ahead for South Africa after widespread flooding devastated large parts of the country during December and January. Commercial and emerging farmers, rural communities and townsfolk alike endured the destruction of

crops, houses, roads, transmission lines, schools, bridges, water pipelines and other infrastructure. At the time of writing no final figures were available but damage was estimated to run into billions of Rands. A total of 33 municipalities were declared disaster areas, and more than 14 000

families have been affected, the majority being in KwaZulu-Natal. In his State of the Nation address in February, President Jacob Zuma allocated R800-million towards disaster relief efforts. Various private institutions and international donors have also availed financial assistance.



*While thousands of visitors flocked to see the Augrabies Waterfall farmers upstream of the national park were brought to their knees by the devastation of floodwaters. In the Lower Orange River region alone 8 439 ha of agricultural land were flooded.*

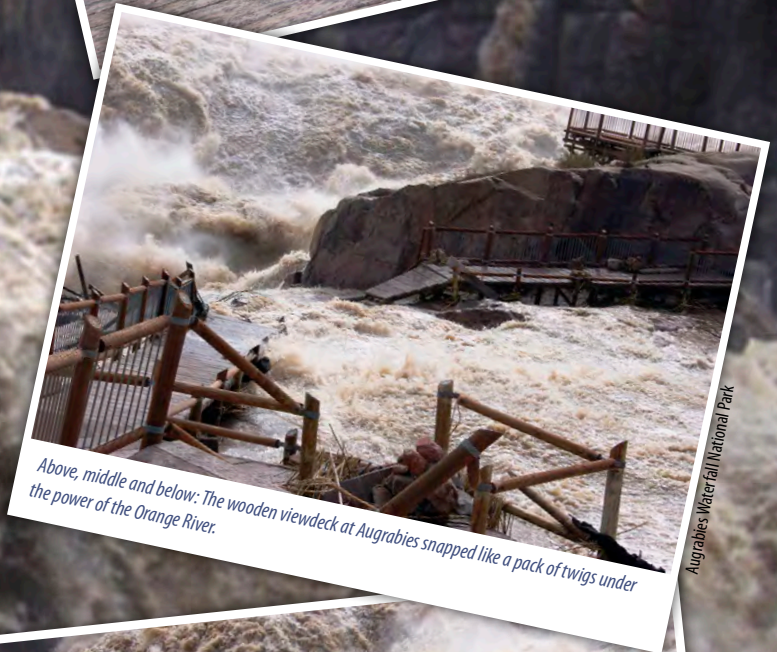


The Orange River at the Augrabies Waterfall National Park.

Augrabies Waterfall National Park



Augrabies Waterfall National Park



Augrabies Waterfall National Park

Above, middle and below: The wooden viewdeck at Augrabies snapped like a pack of twigs under the power of the Orange River.



Augrabies Waterfall National Park



The Orange River in Augrabies Waterfall National Park. The Gariep Dam located upstream of the park peaked at 119% full with an outflow of 2 500 m<sup>3</sup>/s.

Augrabies Waterfall National Park

Augrabies Waterfall National Park







Theo Venter

Damage to the Schoemansdrift bridge following the Vaal River floods.



Theo Venter

A swollen Vaal River near Parys, Free State. A peak outflow of 2 400 m<sup>3</sup>/s was released from the Vaal Dam's 17 open sluices in January, rivalling 1996 peak outflow figures. At Vaal Barrage 31 of the 35 sluices were opened.



Theo Venter

Vaal River water gushes over the Schoemansdrift bridge. In the Upper Vaal damage was limited to urban areas where development had been allowed in the flood zone.



Lani van Vuuren

Cars precariously cross one of the low-level bridges in Centurion over a full Hennops River.



Lani van Vuuren

Debris lies on one of the low-level bridges in Centurion, Pretoria, submerged when the Hennops River overtopped its banks. Tshwane fireman Henry Knox was one of the victims of the raging river.



## KAKAMAS – Oasis in the desert

*The recent floods in the Lower Orange River again emphasised the important contribution of irrigated agricultural in the Green Kalahari to the country's economy and food basket. Lani van Vuuren turns back the clock to the birth of Kakamas, a principal centre in the region.*

*From a settlement barely producing enough food for its inhabitants Kakamas is now known the world over for its export grapes, wines and raisins.*

**F**rom mid-1895 to late 1896 a severe drought raged over large parts of South Africa. At the same time rinderpest, a fatal cattle disease, swept through southern Africa. In the Transvaal alone, half of the farmers' cattle herds were wiped out. Then the South African War broke out in 1899. Apart from killing thousands of people, mostly

civilians, the war finally crushed the Republics' farming communities through Britain's Scorched Earth Policy, which saw an estimated 30 000 farmsteads being destroyed in the Transvaal and the Orange Free State. Most of the herds in the Boer republics were decimated, with crops and implements destroyed.

These events brought thousands

of farmers to their knees, and many found themselves without income and on the brink of starvation. Those that did not become *bywoners* (labourers who provided their services in exchange for privileges such as housing and grazing) on other farms flocked to cities in search of work. The majority of these termed 'poor whites' or *Armlankes* were

Afrikaans-speaking and members of the *Nederduitse Gereformeerde Kerk* (Dutch Reformed Church).

Following repeated calls to the church to alleviate poverty among members of its congregation, the idea of establishing labour colonies was born. It was thought that these colonies, which would be established around irrigation schemes, would not only help clothe and feed poor families, but also enrich their spiritual lives and improve their education (one in ten poor whites were totally illiterate in those days).

In 1894, the church investigated several sites for the establishment of such a settlement and, in the end settled on an area on the banks of the Orange River. The area came highly recommended by Rev. Christiaan Hendrick Wilhelm Schröder who had established a mission station among the local Korana people at Olyvenhoutsdrift (now Upington) in 1871. Schröder, of German parentage and a carpenter by trade, had successfully constructed a water canal in Upington several years earlier. Upon completion in 1883, the canal was 32 km long.

## WATER AND THE DUTCH REFORMED CHURCH

**K**akamas was not the only irrigation settlement established by the Dutch Reformed Church. In 1908 the church purchased six farms in the Rouxville district along the Orange River in the Free State with the aim of establishing an irrigation settlement there. A weir was constructed on the north bank of the river close to Aliwal North along with a main canal of 9 km. This work was completed in 1912. The settlement, to be known as Goedemoed, was officially opened on 23 March, 1913.

Every settler received 3,5 ha with a total irrigable area of 513 ha. Similar to Kakamas the church retained ownership of the land, with rent of £10 a year payable. By 1922, there were 80 families settled at Goedemoed.

## THE START OF THE KAKAMAS SCHEME

**I**n 1897, the Cape government granted the church two farms, *Soetap* and *Kakamas*, on the left bank of the Orange River for the establishment of its irrigation settlement. Schröder would become the settlement's first Superintendent. A canal had to be built to enable irrigation on the scheme. Government engineers estimated that such a canal would cost £29 000 to be constructed, however, Schröder

reckoned it would only cost £5 000 if done 'the Boer way'.

Famed trader Japie Lutz, who had assisted Schröder in the construction of the Upington canal, came to assist the reverend in the design of the canal (interestingly, he had no engineering qualifications) and work started on the left bank (or south) furrow on 4 July, 1898. On the Sunday prior to the start of the project a special church service was held to pray for the success of the project and Schröder personally visited the tent of every prospective settler who had arrived to work on the scheme.

*The Kakamas canals were initially earth furrows which were later improved and concreted by the Department of Water Affairs.*



Lani van Vuuren



Lani van Vuuren

to which spirit levels were attached, were used as instruments to determine the levels of the canals.

By April 1899 the left bank furrow was completed to about the eleventh kilometre where the first erven were cut up for the 60 men who had worked the longest. Lots were drawn for choice of plot, each being 5 ha in extent. Livestock could be grazed on communal land. No work was undertaken during the South African War, but construction resumed following the signing of the peace accord and, in 1908, the left bank furrow (35 km long), with extension to Marchand, was finally completed. This was followed by the completion of the 43 km-long right bank (north) furrow in 1912. For this purpose the church purchased 9 farms or portions of farms. The scheme was financed entirely by the church through collections at Sunday services across the country.

The canals feature exceptional dry piling of the stone along rocky slopes which can still be seen today. By dry piling instead of excavating through rock, the settlers were able to cut the overall costs of the canals considerably. FE Kanthack, who was later to become Director of Irrigation

*More than a hundred years after their construction, the Kakamas canals still play a crucial role in agriculture in the Northern Cape.*

The site for the intake was chosen at Neus, just upstream of the Neus Falls, where the river drops some 9 m. White labour only was used and labourers were paid three shillings a day and promised allotted pieces of irrigation land for their efforts. Food and clothing was supplied to them at cost price from a specially constructed warehouse. The first shops at Kakamas grew out of this warehouse (by 1945 there were four trading stores). On 18 July, the first

school with 30 pupils was opened in a canvas tent.

Construction was not easy going. Most of the men were inexperienced and ill equipped for the hard physical labour and the harsh conditions on site took its toll. Merely getting materials and equipment to Kakamas proved quite a challenge. The nearest railway ended at De Aar some 418 km away and all tools, dynamite, and others materials had to be transported from there by wagon. Rifles,



*Remnants of the original water wheels can still be viewed at Kakamas. The wheels were used in lieu of pumps to transfer water to irrigate higher-lying areas. They have all been declared national monuments.*

Lani van Vuuren

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(the forerunner to the Department of Water Affairs) was highly impressed with Lutz's work when he visited the scheme in 1911. "The 6 000 yards of drystone walling, much of which is of very considerable height, is all of first class workmanship and besides being highly efficient there is a finish about Lutz's work which is rarely to be found in work not carried out under direct professional control," he said.

For the north bank furrow two tunnels were also required, the longest being 192 m. From time to time the furrows were extended to bring more area under irrigation.

## LIFE AT THE SETTLEMENT

Not just any person could come and live at Kakamas. Settlers were carefully screened – they had to be men with families, had to prove they were poor, and had to be of 'good conduct' (no 'squatters, vagrants or vagabonds' allowed). Applications were submitted to the Superintendent at Kakamas

through their local church minister. By 1945 there were 574 families on the scheme, and the total (white) population was around 3 500. The main products grown were sultanas, wheat, peas, beans and usurn.

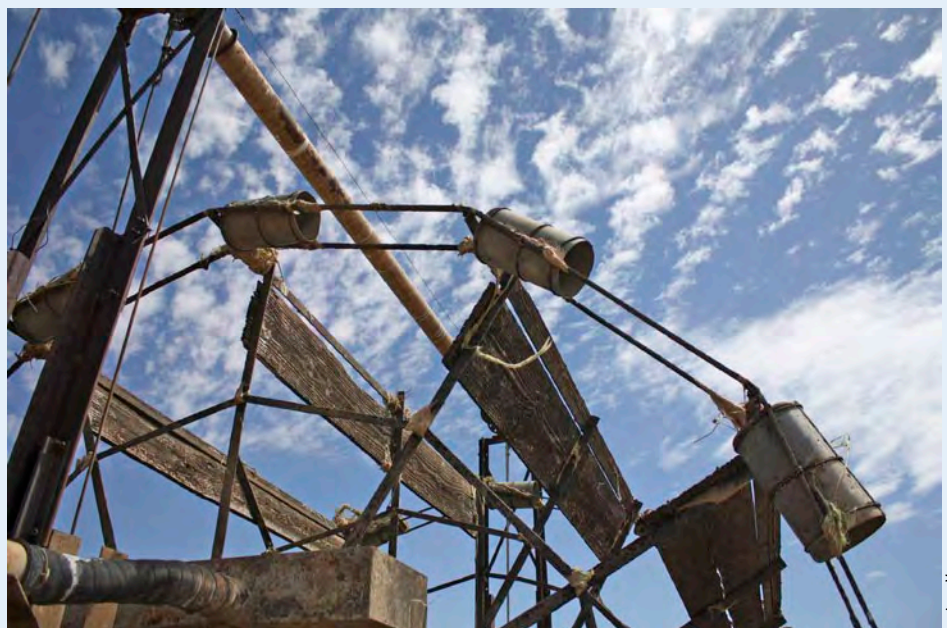
Each settler was allowed a leading sluice consisting of a short pipe 150 mm in diameter with stopper, which they were allowed to open for eight to ten hours a week (in periods of low rainfall the allowance was reduced accordingly). The farmers themselves were responsible for cleaning the furrows. Each man was responsible for the maintenance of the length running along his plot, the common portions being maintained by a system of calling up labour. The plots remained the property of the church, and an annual rent of £10 was paid. If after the probationary period of five years the settler proved himself, he was allowed to stay on the plot.

A very strict code of conduct was followed with severe implications for those who violated the rules. Settlers were required to be neat and tidy, and all plots had to be kept clear of weeds. Fencing had to be kept in good repair, and pigs and poultry found wandering outside dedicated areas were summarily shot. The Christian observance of Sunday was

compulsory for adults and children, as was education. No dancing, swearing, filthy language, drunkenness, or immorality was allowed and the sale or making of liquor was strictly prohibited. All new settlers had to undersign a document whereby they agreed to abide by these rules. Those who transgressed could be fined up to £5 or removed from the settlement.

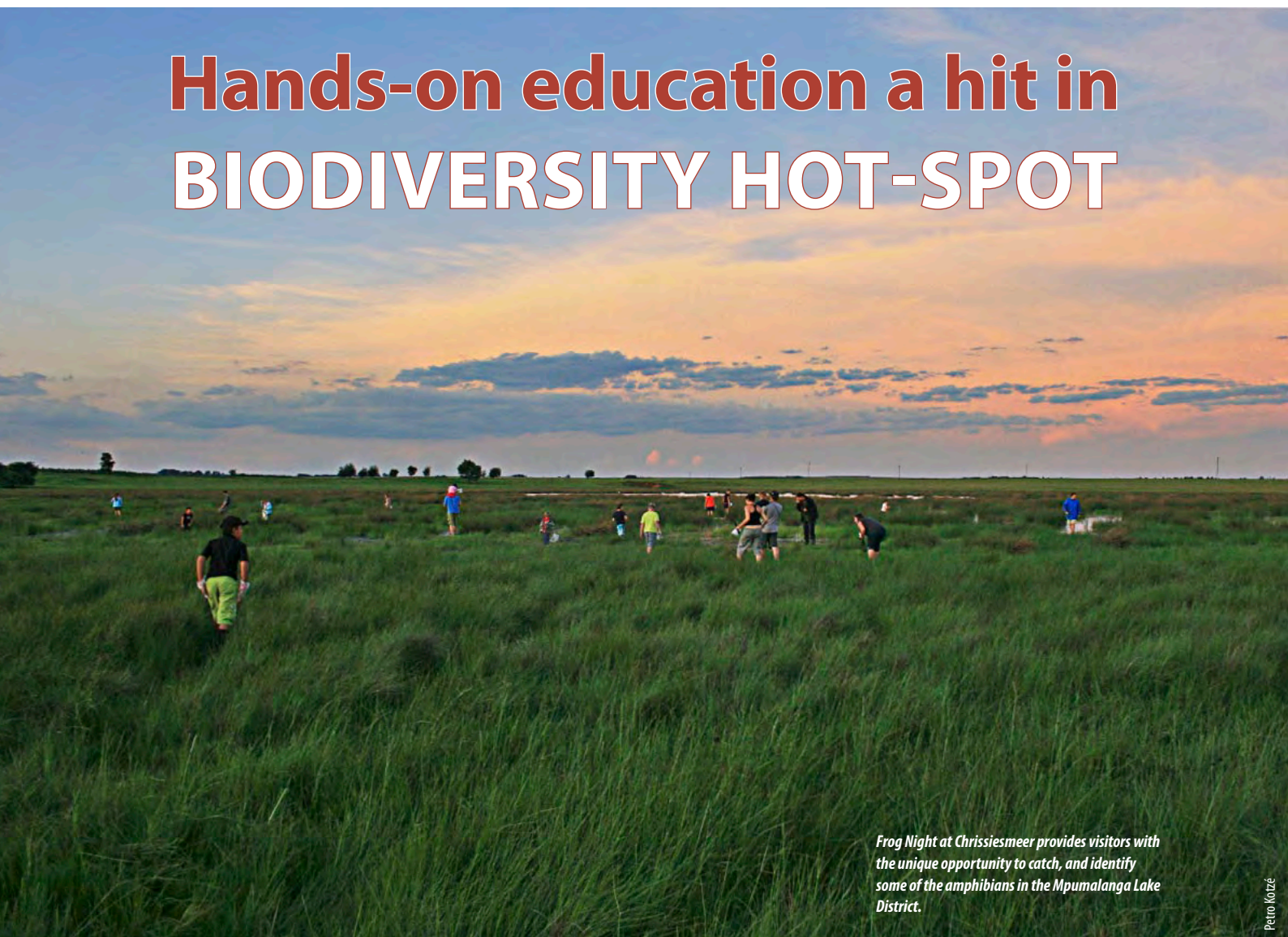
One of the most endearing characters of Kakamas was Ouma Chrissie Viviers, who with her husband joined the labour settlement in 1904. In the absence of a hospital or clinic she served the community dutifully as a nurse for many decades. She had no formal training, but relied on her own Boer remedies and was a competent midwife. It is said that no distance was too far for her to travel, and not even the Orange River in flood could prevent her from reaching her patients. During the outbreak of Spanish Influenza in 1918, the Kakamas community was found to be far less affected than the rest of the region, thanks to Ouma Chrissie's traditional medicines. Not even the arrival of Dr Van Niekerk in 1927 stemmed the flow of patients to her door. She still saw patients up to her death in 1940. □

*A close-up of a water wheel.*



Lani van Vuuren

# Hands-on education a hit in BIODIVERSITY HOT-SPOT



*Frog Night at Chrissiesmeer provides visitors with the unique opportunity to catch, and identify some of the amphibians in the Mpumalanga Lake District.*

Petro Kotzé

## ***An eco-tourism initiative in Chrissiesmeer is teaching young and old to catch on to conservation.*** ***Article by Petro Kotzé.***

**A**s the sun sets, the choir starts a vaguely organised array of snores, rings, whistles and pings. The audience is ready for the show, donning the necessary headlamps and plastic bags. This is no ordinary performance, especially not from the elated crowd. Rather, it is a somewhat alternative choice of entertainment, especially for a weekend in the countryside. Welcome to Frog Night, an annual highlight in

Chrissiesmeer, Mpumalanga, for the past 13 years.

Located just over 20 km from Carolina, a stone's throw from the Swaziland border, the Chrissiesmeer village itself is but a handful of streets surrounded by a lively community dependent mainly on farming and forestry. A small sign at the entrance provides the first clue to where the town's priorities lie, as it warns drivers to slow down...for the frogs. "This is probably the only town where you will have rocks thrown at your car if you run over a frog," the barmaid in the town's oldest, and only hotel, says cheerfully.

One particular weekend, at the beginning of each December since 1997, is an interesting weekend to be a frog around Chrissiesmeer. About 160 people of all ages head to the area for Frog Night. Presented by the Matotoland Eco-Tourism Association, the event not only educates guests about the amphibian species found in the area, but gives them a chance to get to know them first hand, literally donning sneakers and plastic bags to catch them in one of the abundance of local pans.

However, visitors to Chrissiesmeer who think that frogs are the area's only claim to fame are dearly mistaken.

## MORE THAN MEETS THE EYE

In general, pans in South Africa are spread in a band across the interior. The bulk sits in the drier, western part, around the Northern Cape, Free State and North West Province, while a unique cluster in the eastern part is centered in Mpumalanga around Lake Chrissie,

Really an elevated plateau, the MLD is a unique geomorphic entity. In fact, it has been described as a glimpse of one of the most ancient land surfaces in southern Africa and between 10 and 20 million years old. Frogs are not the only reason why visitors should tread carefully, underfoot is possibly one of the last remnants of the post-Africa I surface.

**“This is probably the only town where you will have rocks thrown at your car if you run over a frog.”**

the largest natural body of freshwater in the country (with a circumference of 25 km). Some 270 pans are scattered in a 20 km radius around the village of Chrissiesmeer, and are also less saline than their western counterparts.

Here, a number of features are of significance. Even though there are no rivers in the area, it's surrounded by the drainage basin of four river systems; the Vaal River, which eventually turns into the Orange at Douglas and ends in the Atlantic, is one. The Komati, which then flows past Komatipoort to Mozambique, is another, while the Usutu River that ultimately empties into Maputo Bay is the third. The last is the uMpuluzi.

The perennial (during normal rainfall seasons) pans of the Mpumalanga Lake District (MLD), as the pan field is known, receive water in a number of ways. Rainfall and run-off from surrounding watersheds are two sources. Some water also percolates into the ground to become groundwater, of which a small amount migrates into the pans.

Furthermore the area, specifically the Tevreden Pan Peatland Complex in the northern part of the MLD represents a unique wetland type uncommon in the South African landscape, namely peatlands (also refer to *The Water Wheel*, July/August 2010).

Post Africa I and II refer to periods of uplift and tilting of the sub-continent (respectively 20 million and 5 million years ago) that resulted



Petro Kotzé

in the 'rejuvenation' of rivers in the interior. As a result, downwards and headwards erosion took place, removing the veneer of ancient soil and exposing younger erosion surfaces. Some of the old land surface

*Above: Frogs are placed in see-through, inflated bags for easy identification, such as this Rattling Frog (*Semnodactylus wealii*).*



Petro Kotzé

*Left: The Rattling Frog (*Semnodactylus wealii*).*



**DID YOU KNOW?**

**T**here are no Rain Frogs in the MLD. It is speculated that the predominant soggy (clay) soil is the reason, as the species prefer sandy soil for breeding purposes. During mating, the male of this species is glued to the back of the female (with a sticky secretion). The eggs are laid in burrows, within which the tadpoles develop and emerge from as fully formed froglets.

No one is sure what the lifespan of a frog in the wild is (being understandably hard to track) but Bullfrogs in captivity have lived up to 25 years. This hardy amphibian buries itself during times of drought, where it is able to slow-down its breathing and heartbeat to almost zero. It can remain in this state for years at a time.

The female Foam Nest Frog is fertilised by about ten males at her sides, which generate foam by churning the egg jelly with their hind legs. Nests are common in trees that overhang pans in the bushveld. When the tadpoles hatch, they fall into the water below.

can still be identified at the MLD, where it is slowly being eroded being encroached by head-cutting of the four rivers mentioned earlier.

The origin of the pans is still a matter of speculation. A popular hypothesis was put forward by the late Prof John Wellington. He theorised that the pans can be linked to form an eastward flowing drainage network, which once formed a tributary network to the ancestral uMpuLuzi. When head-cutting by the Vaal River cut into this drainage network, it was deprived of its water and rendered moribund (stagnant) as the water was diverted to the Vaal itself. Westerly winds formed dunes with sand from the river beds, which divided the drainage network into a series of isolated segments (the pans).

Other hypotheses include regional warping of the sub-continent (the pan belt coincides with a continental-scale drainage divide that divides northerly from southerly flowing tributaries) or even the occurrence of exceptionally dry periods that coincided with the ice ages in the Northern Hemisphere. The thought is that reduced vegetation during these times would have promoted the formation of wind-blown sand deposits along the courses of the rivers.

Around 20 million or so years later in this same geologically

significant region, one night in December 2010, a question was posed: "How do you catch a frog?"

**SNORES, RINGS AND WHISTLES**

**T**he answer came in a confident voice from among a hoard of excited, young faces: "You throw it with your Croc!"

Luckily for the MLD's 13 frog species, explained the night's speaker, herpetologist Jerry Theron, the answer is much more diplomatic: You listen to them. Male frogs call to attract their mates. Most females have no larynx, with the one exception in South Africa being the female Platanna. Each frog's call is like a fingerprint, and is species-specific; a deep vibrant snore for the Guttural

*This Common Caco (Cacosternum boettgeri) was one of the many caught on the night.*



Petro Kotzé



Toad (*Bufo gutturalis*), a clear 'quoip' for the Bubbling Kassina (*Kassina senegalensis*) and a piercing 'pip', sometimes in short bursts, for the Striped Stream Frog (*Strongylopsus fasciatus*).

Incredibly, what would sound like a confusing choir of clicks, pips, snores, rings and whistles to the untrained human ear, is a clear signal for female frogs that indicate potential mating sites. The amphibian ear is exceptional, particularly since the female can only hear the 'voice' of her specific species. The sounds, formed by blowing air over the vocal chords into a vocal sac that resonates, differ in frequency, pulse rate and duration, making each quite unique. As for female choice, choir leaders apparently stand a better chance to be selected, while size and age (bigger and older being the preference) are also possible deal-breakers.

Calls, however, can also indicate if a male frog's territory is encroached upon. "The Painted Reed Frog, for example," explains Theron, "has an inter-male spacing of 50 cm." If this space is entered, the mating call changes to a territorial call. A River Frog's usual 'click-click-click' changes to a feisty 'meow' and a somewhat gentlemanly vocal fight results.

During the December Frog Night, the talk on the aspects of the breeding ecology of South African frogs was followed by a visit to a nearby pan, just as the sun was setting (most frogs are nocturnal). In summary, frog hunting is dirty work. More specifically, it is wet, muddy and not for the faint hearted or impatient. Theoretically, they occur around the shallow edges of the pan.

The trick is to listen for the call, approach the direction slowly

### DIGGING DEEP TO SAVE THE MLD

The pristine pans of the MLD are under threat from rampant applications to develop open coal mines in the area. In fact, says Mpumalanga Lake District Protection Group (MLDPG) project-coordinator, Koos Davel, there is literally not one farm in the region between Carolina, the Warburton Road, and the Lothair/Ermelo Road that has not received an application for prospecting rights.

The trend, explains Davel, is for any investment or financing company, which has no interest in mining, to apply for easily-attainable prospecting rights. Once the potential for coal mining can be proved, the mining right is then re-sold for huge amounts of money to mining companies.

The MLDPG has been vigorously opposing these applications, as opencast coal mining will disrupt the hydrology of the pans and cause irreversible pollution. The organisation, with the Mpumalanga Tourism and Parks Agency (MTPA) aims to have the

MLD declared a Ramsar site, in order to offer the area more protection. The Ramsar Convention, otherwise known as the Convention on Wetlands of International Importance, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Studies have shown that the bulk of the aquatic biodiversity in the area is irreplaceable, while the water is almost pristine. Geohydrological investigations of fountains on the farm *Lusthof* have proved the exceptional quality of water, rated substantially cleaner than the South African Class 0 (ideal) drinking water quality. "The water is so clean," says Davel, "I can still see birds feast on fresh-water mussels in a vlei nearby my property."

The fight to save the MLD from development is ongoing.



Petro Kotzé

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*The collected species are identified before being released back into the pan where they were found.*

*Cape River Frog (Amietia fuscigula).*

(at which point they will most likely stop, having been disturbed), wait, and repeat the exercise. As a rule, captured frogs are kept in clear, inflated, plastic bags for easy identification. On the night, eager faces (of both the young and the young at heart) then discussed size, call, skin texture and so forth for purposes of identification. “Kids rarely get the chance for an opportunity like this to learn more about nature,” explains Theron at the end of the “Lucky 13<sup>th</sup>”

Frog Night, after the prize giving and frog count.

Even more encouraging is the increasing amount of people interested in attending the festivities – this year, they had to show many away. “Frogging” (as it is also referred to) is by no means a common choice for a weekend activity but, by the looks of it, Chrissiesmeer and the Frog Night’s encore will resound for a long time still to come. □



Petro Kotzé

# 3<sup>rd</sup> ORANGE RIVER BASIN SYMPOSIUM

Hosted by the UNIVERSITY OF THE FREE STATE'S STRATEGIC ACADEMIC CLUSTER  
"Water management in water-scarce areas", BLOEMFONTEIN

8-9 JUNE 2011

## THEME: THE ROLE OF WATER IN FOOD SECURITY

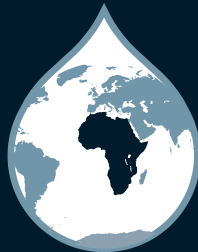
This is to be our third Orange River Basin Symposium. Please join us in discussing matters of mutual interest in a friendly atmosphere. The Orange River is South Africa's largest river. The catchment straddles South Africa, Lesotho, Botswana and Namibia and plays a major role in agriculture, industry, mining and rural development. The Orange River is also a major source of water for the dry west of the sub-continent and it is the subcontinent's major non-perennial river system.

## FOCUS AREAS OF THE SYMPOSIUM:

The Programme is broadly accommodating and not restricted to the overall theme, but we ask participants, where possible, to consider it in the light of the following preliminary topics:

## PROVISIONAL THEMES:

- Environmental water requirements
- Water Harvesting
- Changing environments
- Water-related rural development issues
- Water-related urban development issues
- Training in Integrated Water Management
- Transboundary Water Issues
- State of the Orange River
- The role of water in food security
- Acid mine drainage
- Wetlands
- Water Disaster Risk Management



STRATEGIC ACADEMIC CLUSTER:  
WATER MANAGEMENT IN  
WATER-SCARCE AREAS  
UNIVERSITY OF THE FREE STATE, SOUTH AFRICA



## OBJECTIVES OF THE SYMPOSIUM

The symposium aims annually to provide a forum and a communication channel between academics, researchers, public officials (local to national, government and parastatal), industry, suppliers, consultants and development organisations interested and affected by the Orange River Catchment. In line with the objectives, facilities can be made available for associated meetings, workshops and courses.

## IMPORTANT DATES:

Second Announcement: 11 April 2011

Abstract Deadline: 2 May 2011

## REGISTRATION:

EARLY BIRD: R1 000 (before 6 May 2011) per delegate, payable in advance.

LATE FEE: R1 400 (after 6 May 2011) per delegate, payable in advance.

Subvention will be considered for UFS staff and students on application. Fees cover lunches, a dinner, teas and the programme.

ENQUIRIES: Sanet Neethling  
Tel: +27 051 401 2863, Fax: +27 051 401 2629, E-mail: [neethlingis@ufs.ac.za](mailto:neethlingis@ufs.ac.za)

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## Project tests mechanised SOIL MOISTURE CONSERVATION techniques in heavy clay soils

*Lack of adequate water poses a major constraint in increasing agricultural production in semi-arid areas in South Africa. However, the use of appropriate crop production techniques, especially those that conserve soil and water, could assist greatly in this regard.*

*Article by LF Joseph and JJ Botha.*

**L**ike many other semi-arid areas in the world, South Africa's food production is limited by its scarce water resources. Irrigated agriculture is the biggest consumer of water in the country.

There are various soil and water conservation techniques currently being practiced in the semi-arid areas of South Africa, mainly in homestead gardens. For example, successful application and adoption of techniques such as in-field rainwater harvesting has been reported in homestead gardens in Thaba Nchu in the Free State (more than 1 000 households) and around Alice in the Eastern Cape (more than 260 households). The challenge now is to mechanise some of these soil and water conservation techniques and extend their application to the croplands.

To this end the Water Research Commission is funding a research project entitled 'Rainwater harvesting and conservation for rangeland and cropland productivity in communal areas in selected provinces in the semi-arid area of South Africa'. One of the main objectives of this project is to perform on-station and on-farm research and testing/applying appropriate rainwater harvesting and conservation techniques and practices specifically for rangelands and croplands.

The Agricultural Research Council's Institute for Soil, Climate and Water (ARC-ISCW) is currently conducting the project at the Glen

Agricultural Institute as well as four rural communities in the Free State. Research is also being undertaken by the institute in Limpopo (Towoomba Research Station and Lambani community) and the Eastern Cape (Fort Cox Agriculture & Forestry College and Kwara Kwara community).

This article deals with the implementation of three mechanised soil and water conservation techniques, i.e. mechanised basin, daling plough and in-field rainwater harvesting, on heavy clay soil at the Towoomba research station in Limpopo.

## IMPLEMENTATION OF MECHANISED SOIL WATER CONSERVATION TECHNIQUES

The mechanised basin (MB) plough was originally developed for the purpose of veld rehabilitation. The implement creates basins for the collection of rainwater. The plough has a basin attachment which pivots on the rear of a three-point hitched ripper. The scraper at the rear of the attachment creates the basins.

The ripper tine operates directly in front of the attachment to break up compacted soil. Downward movement of the attachment is limited by a chain, thus enabling the tractor to lift the whole machine clear of the ground. When the ripper tine is engaged, the shaped control wheel controls the movement of the scraper blade, resulting in a row of basins being created.

In turn, the Daling plough was developed by a Mr Daling from Settlers in Limpopo. It works on the contour and creates two one-metre runoff areas with a basin in the middle. By making the runoff area shorter the farmer is now able to collect water event from the smaller rainfall events with little runoff. A chisel plough is connected directly to the transmission shaft of the tractor. The basin plough then follows directly behind the chisel plough. The chisel plough first loosens and turns the soil before the basins are constructed.

In-field rainwater harvesting consists of a no-till 2,4 m strip sloping towards a metre-wide basin area. The no-till strip is used to induce runoff by using the natural slope of the land and crusting characteristics of the soil. Runoff water is collected in the basins, the first phase is done by using a contour plough which creates 20-cm high contour ridges while the second phase of basin creation is done with a basin plough which creates a 10-cm deep and metre wide basin every 1,5 m.

**The biggest challenge of utilising these implements in heavy clay soil is to implement the treatments at the 'correct' soil moisture content. If the soil is too wet or dry the treatment cannot be implemented.**

During 2008/09 these treatments were implemented by using the three implements described above. It was found that it was practical to plant and control weeds using a boom sprayer. Planting (0,9 m row width) was done on the basin area where rainwater is collected.

The biggest challenge of utilising these implements in heavy clay soil is to implement the treatments at the 'correct' soil moisture content. If the soil is too wet or dry the treatment cannot be implemented. Every drop of rainwater is needed so that the rainwater harvested infiltrates the soil beyond the evaporation zone, but by delaying the implementation of treatments until the soil is at the correct moisture content, the rainwater that is supposed to be harvested can be lost through runoff.

Heavy clay soils are also known for their high physical activity – shrinking and swelling upon drying and wetting. It was observed in the 2008/09 seasons that by the end of the growing season, the ridges on all three catchments had disintegrated

due to high physical activity of the soil. To avoid this, maintenance of these treatments is needed during the growing season; however, this is currently impossible. Therefore, the implements should be modified so that it is possible to maintain ridges during the growing season when the farmer is still able to drive into the crop fields with a tractor.

## RESULTS

The results from the 2008/09 growing season indicate that, on average, mechanised soil and water conservation techniques increased grain yield by 18% and 5% for sunflower and maize respectively, compared to conventional tillage.

## RECOMMENDATIONS

It is recommended that the implementation of these treatments be done three times, i.e. during the fallow period, a few days before planting, and during the growing season. Implementation during the fallow period will ensure collection of rainwater which will increase pre-plant soil water content. □

*Implementation of in-field rainwater harvesting treatment.*



Courtesy Frans Joseph

# WRC water harvesting short course materials get the nod



*Saaidamme is a form of rainwater harvesting that has been applied in South Africa for hundreds of years.*

Courtesy Jonathan Denison

***Water harvesting and conservation (WH&C) has gained increasing priority in rural development and agricultural initiatives over the last ten years in South Africa. The Water Research Commission (WRC) is developing an active role in developing the science of WH&C by targeting research grants to modernise, localise and quantify methods and their benefits. Words by Jonathan Denison.***

**T**he most recent contribution is the development of a comprehensive learning package on water harvesting and conservation, structured as a 30 credit short course, and which has received resounding approval from colleges and stakeholders nationally. The course is designed to be presented by AgriSETA accredited service providers and the Agricultural Colleges, among others.

It aims to equip rural development fieldworkers and agricultural college graduates with both the technical and the facilitation skills to effectively take water harvesting and conservation technologies and approaches to farmers and home-gardeners.

Up to the late 1990s, WH&C was promoted mainly by non-governmental organisations working towards food security through improved gardening and crop-production methods. Trench beds, diversion furrows, swales, mulching and other techniques can be found around South Africa, usually, but not always at a small scale. Although still not widely known, WH&C has also been practiced at an impressive scale by commercial lucerne farmers of the arid Northern Cape who are dependent on thousands of hectares of 'saaidamme' or floodwater harvesting basins, to sustain their sheep production and the regional economy.

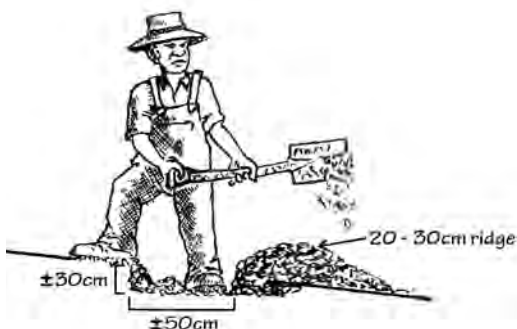
Even with these working systems at all scales and across cultural and income groups, the many different water harvesting and conservation techniques remained on the fringe of mainstream practice and policy until the last decade. However, this has changed and WH&C is now increasingly part of the common discourse by politicians and scientists alike. It is recently embedded in South African government policy and subsidy arrangements across departments, including the Department of Agriculture (in the National Five-Year Plan); the Department of Water Affairs (in the resource poor farmers subsidy); and the Department of Rural Development and Land Affairs (in the Green Paper), among others.

The value of water harvesting approaches are that they offer relatively low-cost interventions that can be implemented in stages as resources allow; and they have proven

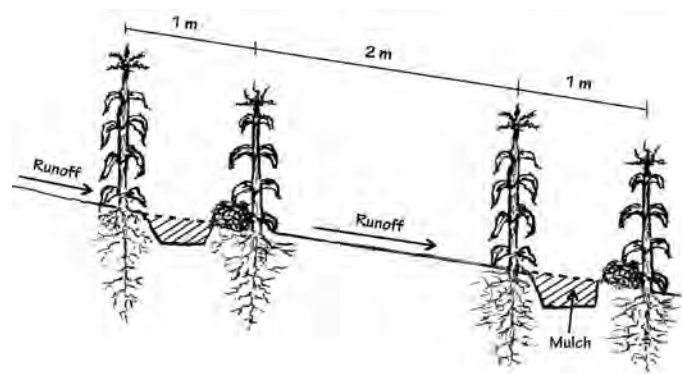
outcomes of increased yield, reduced risk of crop failure and greater profitability. A scan of the WRC website for water harvesting publications provides convincing and credible evidence of the increased role that these approaches will have in securing food into the future.

*The Comprehensive Learning Package on Water Harvesting and Conservation* was developed over three years by the Umhlaba Consulting Group and collaborating researchers, artists and educationalists, including a piloting team at the University of KwaZulu-Natal. The materials were crafted following wide consultation with government departments and potential users, and responds to the Department of Agriculture requirements for Unit Standard compliance (Set at NQF 5). The materials, in their final form, are also compatible with the Quality Council for Trade and Occupations requirements for a Short Course; in this case comprising 30 credits.

The package comprises three main parts: Part 1 and 2 are geared to students of rural development and agricultural extension, while Part 3 is developed specifically for resource poor farmers and gardeners – who are the primary end-users of the learning package initiative.



**The Technical Manual** introduces the principles of water harvesting and conservation, the water cycle, soils, water and ecosystems. It then sets out detailed, step-by-step illustrated descriptions of how to implement the 13 different WH&C approaches that were selected as being most appropriate to the South Africa context.



**The Facilitation Manual** is based on contemporary participative research and extension thinking, consolidated in the 'Participatory Technology and Innovative Development' approach. The course challenges students to consider the concept of development, to identify and appreciate indigenous knowledge and sets out a sequence of interactions to ensure respectful and motivational engagement with

a range of people. The approach is centred around the well known Kolb Cycle of action learning. The specific intention is to engender a paradigm shift in the way the course-graduates engage with gardeners and farmers, primarily by respecting their existing knowledge base, and promoting knowledge gain through joint experimentation, shared learning, self-monitoring and information sharing.



**Farmer handouts** are fully illustrated, A4 size materials which can be left with farmers and gardeners. The black-and-white line drawings can readily be photocopied and left with farmers and villagers as reference materials to aid their implementation and experimentation with whatever methods are suitable to their context.

A recent survey of the Agricultural Colleges and other potential users who were circulated the draft materials, found widespread approval of the content, illustrations and educational approach. The vast majority of the Agricultural Colleges expressed

substantial interest to use the materials both as resource material for existing courses, and are keen to offer a WH&C short course.

Two colleges have already started to embed content from the drafts in their 2011 coursework, unable to wait for the final print. One College Head who was interviewed said: "In the context of climate change and in our arid country, we must make sure that our students embrace these techniques. They are an unavoidable part of our agricultural future."

The guides will be available from the WRC in April. □



# Women share secrets of career success in water

*The fact that legislation and policies promoting gender equality have paved the*

*way for women to take up positions in the top echelons of management in the water sector does not mean that women do not have to work hard to earn the positions they occupy. A soon to be published Water Research Commission (WRC) study reveals some of the opportunities and challenges faced by women in water.*

To understand how women in the water sector have achieved positions of seniority and leadership, the WRC commissioned a study on the criteria necessary for the career success of women in the sector. The study found that women who participated did not feel that the positions they occupy were 'given' to them. While legislation enabled their rise to influential positions, they still had to get the necessary qualifications and leadership qualities required for the positions.

The study was conducted to gain an understanding of how these women progressed to where they have, and to explore the lessons that could be drawn from their experiences to inspire other women aspiring for leadership in the sector. This was a qualitative study that focused on the experiences of 27 women in senior positions in the water sector.

This sample of women included the former chairperson of the Portfolio Committee on Water Services; senior managers in the Department

of Water Affairs; Chairperson of a Water Board; and senior managers in water research institutions.

## WHAT DO WOMEN NEED?

The women interviewed came from varied racial and cultural backgrounds and they all had to overcome barriers to their success in the water sector. These were in varied degrees and included challenges of patriarchy and apartheid. The women agreed on several issues, among others that it was their qualifications which assisted them to rise in the sector. While the progressive legislation on gender equity and various gender policies in the water sector have assisted to remove barriers, these women would not have been able to take up their respective positions without the requisite qualifications.

It emerged from the study that all the women had someone who supported them in their childhood and encouraged them to overcome societal barriers. Some of these enablers were teachers or family members who supported them to enhance their personal lives and to make use of whatever support they could garner at their workplaces to advance their cause in the water sector.

Important also was the role of a mentor to teach these women the ropes when they entered the sector. In some instances, these mentors or enablers were men in the water sector organisations in which these women began their careers.

## SHOULD WOMEN SUPPORT OTHER WOMEN IN THE SECTOR?

It is interesting that the impact of women's leadership in sector

transformation and in furthering a transformative agenda that creates space for other aspiring women was not unanimously supported by the responses. Coming out strongly from the women who did not support this was that the terms of women's employment does not specify that they should be agents of transformation and support other women. It should be noted that when women get into senior positions, they are assessed in terms of their performance and not on the support role they can play in advancing the careers of younger women who are new entrants into the water sector.

The novelty of having women in senior positions can also sidetrack them from the core responsibilities of their job. One woman recalled having to represent the department on other forums simply because she was one of the few women in the senior management of the department. The emphasis on supporting other women and taking up causes that have a gender label attached to them can be burdensome and actually contribute to women failing in their jobs. The extent to which this role is carried out is considered personal as each woman supports other women based on individual inclinations.

## THE REQUIREMENTS FOR SUCCESS

It is clear that the policies have assisted in women gaining access to the positions they hold, which they would not have necessarily occupied prior to 1994 when political and patriarchal systems were less enabling. What then determines the rise of women into senior positions where they can begin to influence policy? The study points to the following:



### Functional capability

At the most basic level women need access to functional capabilities. This includes the ability for women to participate by having practical choices; real opportunities; and substantial freedoms and resources such as well-being, health, control over one's environment; support in terms of welfare and social services; and time and space. These are the core essentials or the fundamentals that form the base from which people, and women in particular, can develop and flourish.

### Education

Education is essential and a necessity for career advancement and success. The women and men interviewed emphasised the importance of education as a means of achieving success in the water sector. The women profiled have high levels of education, some having one or more tertiary qualifications. The importance of education lies in the independence it allows, the confidence it instils, and it is a resource that one owns and cannot be taken away. The women spoke strongly against tokenistic appointments, and asserted that they had been appointed based on merit. They also felt that the only way to improve themselves and their opportunities were through education.

### Hard work and dedication

Coupled with education is hard work and dedication. Both of these are essential to career success in the sector, and it is only with hard work and dedicated effort that growth, improvement and success are attained. The women acknowledged that the legal and policy environments promote women and make provision for the preferential treatment of women; however, it is hard work that enables women to rise to higher levels in the sector.

### Support

Personal and professional support, such as education, was cited as being critical to career success. Personal

support at home, from family, spouses and/or partners provides women with the space and possibility to advance themselves towards realising their goals and ambitions.

Professionally, mentors and/or coaches as well as institutional support have been shown to assist women to progress. It is important to identify and access support and the availability and accessibility of formal and/or informal support in the professional and personal sphere. This has been crucial in that it assists women in dealing with personal and work-related challenges and helps to find and maintain a balance between work and personal life.

Further, an institutional environment that is supportive and innovative in responding to the needs of women and the multiple roles that women have is required. This include, for example, mentorship, training, the availability of daycare facilities, and flexible working hours.

### Passion and ambition

The women related their passion for the work that they do, and their involvement in contributing to the lives of South Africans through the provision of basic services, such as water and sanitation. This has sustained their interest and engagement in the sector.

The sector provides a challenging work environment that is diverse and constantly changing. There is need for innovation, creativity, problem solving, and many other skills that keep people engaged. In other words, the sector provides an environment that is stimulating. Drive, passion and ambition are required to achieve and to succeed. Some women described how the challenges they face within the sector feed their ambition and how they continuously strive to improve the sector as well as themselves.

### Social capital

Social capital in the form of interpersonal networks, contacts, knowledge and other related human resources are assets that can be used to address

needs and interests. These collective assets provide women who are either entering the sector or who are already in the sector with a means to receive and give support; to gain access to knowledge and information; and to establish and be part of a community where ideas, challenges and other facets of work can be shared and discussed. The networks that are formed can be among women only or they can include both women and men.

Either way, it is important that these networks are diverse, representative and inclusive, taking into consideration the reason or objective for forming the network. In some instances, the network can be very informal wherein it is people coming together as friends or colleagues to meet and touch base on matters. However formed, networks and social capital, more broadly, allow and facilitate horizontal collaboration that has fewer barriers or obstacles. These collective networks have great potential to generate individual rewards, such as career opportunities and support networks by encouraging and increasing the capacity of people to work together.

### Characteristics for leadership

The final criterion lies in the qualities that characterise a good leader. While these are qualities that were identified in the women holding leadership positions, they are relevant given that the qualities of leadership in the women interviewed were groomed and inculcated over time in their careers.

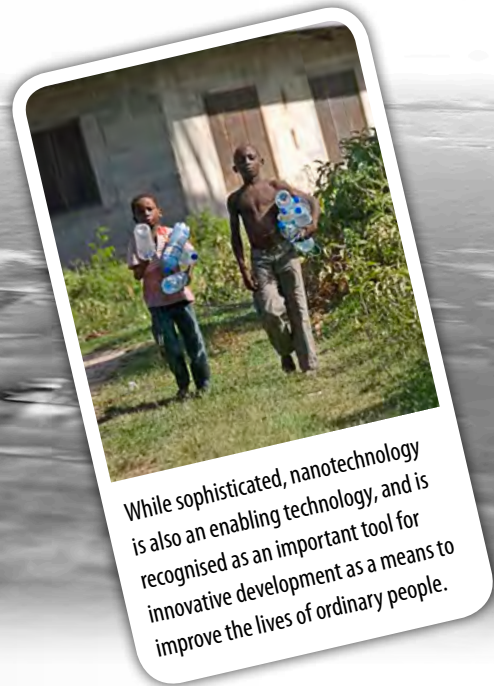
These include a good work and moral ethic; interacting with people in a respectful manner; supporting and providing opportunities to people; working well with people since collaboration and cooperation are essential in the sector; learning from people and sharing information and knowledge with others; fairness and equality; and managing people in a horizontal way that is collegiate and transformative rather than power-oriented and hierarchical. □



NANOTECHNOLOGY  
PUBLIC ENGAGEMENT



# Small things may make a big impact on sustainability



While sophisticated, nanotechnology is also an enabling technology, and is recognised as an important tool for innovative development as a means to improve the lives of ordinary people.

*A nanobot. Nanotechnology is the act of manipulating material at very tiny (nano) scales, essentially at the level of atoms and molecules.*

Some of the most significant challenges facing global society in the 21st century involve the sustainability of the environment (water, soil and air quality), energy, health and food. Existing technologies have had a profound effect on the environment, releasing formidable pollutants into the environment and depleting natural resources. Pollutants from pesticide and fertiliser runoff, runoffs from chemical industries, abandoned industrial sites and mines, as well as gaseous emissions from industries and vehicles continue to aggravate conditions. In addressing environmental sustainability, it is important to attend to the past, present and future by cleaning up past damage to the environment, correcting present problems and preventing future impact on the environment.

Nanotechnology, the science of the extremely small, has the potential to have an extremely large impact on many aspects of society. Unlike many other technologies, nanotechnology has potential applications in virtually all areas of human life, including health and medicine, energy, information technology, material and

manufacturing, and the environment. It is this cross-cutting nature of nanotechnology that gives it the potential to make a big impact on environmental quality and sustainability.

## WHAT IS NANOTECHNOLOGY?

Nanotechnology is the act of manipulating material at very tiny (nano) scales, essentially at the level of atoms and molecules. At these small sizes, the normal rules of physics and chemistry no longer apply and materials often display unique and surprising properties. The ability of scientists to create and manipulate matter at the nanoscale offers previously unenvisioned possibilities for scientific discoveries and technological applications. Nanotechnology has been hailed as the 'leading technology of the 21st century'. It is an enabling technology, recognised as an important tool for innovative development and as a means to improve the lives of ordinary people.

The past two decades have seen rapid global advances in nanoscience and nanotechnology in

all spheres of science, engineering and technology. Scientists, including chemists, biologists, physicists and engineers continue to explore the potential positive and negative effects of nanotechnology-based materials and devices. South Africa is not an exception. Leading South African universities, the Department of Science & Technology's Nanotechnology Innovation Centres and the industrial and private sector are engaged in nanotechnology research and the development of new materials that will ensure sustainability.

## NANOTECHNOLOGY AND ENVIRONMENTAL SUSTAINABILITY

### Climate Change

South Africa, like most countries, faces serious challenges from climate change (global warming). As a developing country pursuing sustainable economic growth, changes in the environment are likely to impede growth. Greenhouse Gas (GHG) emissions such as CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O are major contributors to climate

change. Reducing GHGs is key to mitigating and reducing the effects of climate change. Adapting to these effects is also an important component of the response to climate change. Both responses require viable innovative solutions or technologies.

A report by the United Nations University Institute of Advanced Studies in 2008 identified nanotechnology as one of three innovative technology solutions to climate change. The incorporation of nanotechnology into larger systems such as the hydrogen economy and solar power technology could have a significant impact on energy consumption and GHG emissions. To date, nanotechnology has applications in hydrogen storage and the development of efficient hydrogen-powered vehicles, enhanced and cheaper photovoltaics or solar power technology, the development of new batteries and supercapacitors, and fuel efficiency. A number of research activities to develop these nanotechnologies are being carried out at universities and Nanotechnology Innovation Centres (CSIR, Mintek) in South Africa.

### Depletion of natural resources

For example, water is a critical natural resource and accessibility to clean, safe water is one of the challenges faced by most countries. The properties offered by nanomaterials make them well suited for treating water, and provide an opportunity to refine and optimise current techniques as well as provide new and novel methods for treating domestic, industrial and mine wastewater.

The depletion of petroleum can also be addressed by nanotechnology through its contribution to alternative energy sources such as solar power and hydrogen fuel.

### Preventing environmental degradation

Nanotechnology products and nanomaterials can have less impact on the environment. Lightweight nanomaterials for cars and other means of transportation could save fuel and reduce

materials used for production. Nanotechnology could reduce pollution from energy production and help to limit fossil fuel use through its application in other renewable energy systems. Enhanced battery life through nanotechnology could lead to less material use and less waste. Nanotechnology can also develop products that specifically target improvement of the environment, for example, nanotechnology may be applied in cleaning waste sites and water, treating pollutants or monitoring environmental pollutants.

Nanotechnology can also make current manufacturing processes for other (non-nano) materials and products more environmentally friendly. For example, nanoscale catalysts can make chemical reactions more efficient and less wasteful.

### IS NANOTECHNOLOGY ENVIRONMENTALLY FRIENDLY?

Some drawbacks of nanotechnology may exist. Concerns have been raised that the same properties (size, shape, reactivity, etc.) that make nanoparticles so useful could also make them harmful to the environment and toxic to humans, for example, if they accumulate in drinking water supplies and the food chain. These concerns are exacerbated by the current poor understanding of the fate and behaviour of nanoparticles in humans and the environment. Risk assessment research is crucial for establishing the potential impacts of nanoparticles on human health and the environment: the technology's benefits must be balanced against any unintended consequences. This is a massive challenge, since it is very difficult to monitor the possible impact of the huge volume of diverse nanoparticles being produced and used in different products and applications. Although there are currently no nanotechnology-specific regulations in South Africa due to the relative infancy of this emerging technology, the government, through the DST, is funding a research platform to investigate the environmental, safety and health aspects of nanotechnology.

The Nanotechnology Public Engagement Programme (NPEP) is an initiative funded by the Department of Science and Technology (DST) and implemented by the South African Agency for Science and Technology Advancement (SAASTA), a business unit of the National Research Foundation (NRF). Launched in early 2008, the NPEP aims to promote credible, fact-based understanding of nanotechnology through awareness, dialogue and education to enable informed decision making on nanotechnology innovations to improve the quality of life.

The objectives of the Nanotechnology Public Engagement Programme are to:

- Create awareness around nanotechnology;
- Educate the public on, and enhance their understanding of nanotechnology;
- Enable and stimulate meaningful public debate around nanotechnology; and
- Stimulate interest in nanotechnology and nanoscience as a career in order to ensure long term capacity building in the field;
- Get industry involved in the development of nanotechnology and take the lead in nanotechnology innovation.

For more information on the NPEP, visit [www.saasta.ac.za](http://www.saasta.ac.za) or email [info@saasta.ac.za](mailto:info@saasta.ac.za).



*Air and water pollution control as well as the removal of waste are challenges facing society throughout the world.*



science  
& technology

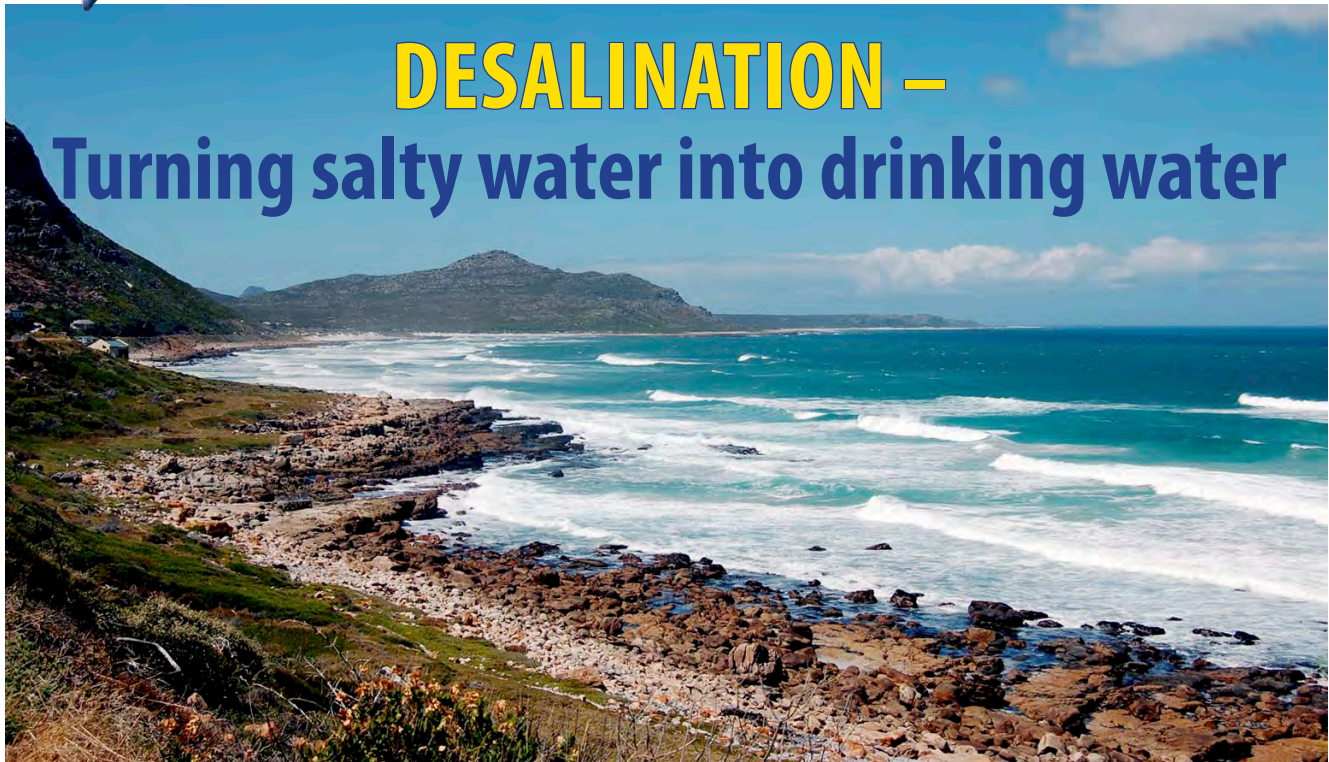
Department:  
Science and Technology  
REPUBLIC OF SOUTH AFRICA



National Research  
Foundation

SAASTA

South African Agency for Science  
and Technology Advancement



## DESALINATION –

### Turning salty water into drinking water



Called the ‘blue planet’ or the ‘water planet’ the Earth’s surface is 70% covered with water. Unfortunately, a very tiny percentage of that water is fit to drink. But what if we could make it drinkable?

Cities are growing and more people are populating the Earth, requiring ever more water for drinking, cooking, washing and growing food, driving industry and generating electricity. This places increasing pressure on existing water supplies, pressing countries to look for alternative sources of water.

Through the years this growing demand for water has led to the development of a sophisticated process called desalination which turns seawater or other brackish water (like salty groundwater) into water that is fit for drinking and other uses. Desalination used to be an expensive process that used a lot of energy, but improvements in the technology is making this a more attractive option, especially for coastal cities and towns.

One of the remaining challenges is what to do with the brine (the waste that remains after treatment). At present, the most common approach is to return the brine to the sea. Other environmental considerations are choosing a source of power as well as site selection. Generally, desalination plants are

*Small desalination plants, such as this one at Madibogo, in North West, are used to treat brackish groundwater for rural communities.*



The desalination plant at Bitterfontein in the Western Cape was the first to be established in South Africa for domestic purposes.

said to have smaller footprints than conventional water treatment plants (in other words, they take up less space). Small, easily transportable desalination units are also used to treat water in emergencies.

There are several ways of separating the salt and other impurities from seawater, but two methods are used 90% of the time, namely multistage flash and reverse osmosis. The multistage flash method uses heat to convert salt water into fresh water (the term 'flash' refers to rapidly bringing the water to a boil, which happens multiple times, or in stages). Reverse osmosis, which is the most commonly used desalination technology in South Africa, works by forcing seawater through many layers of a specialised membrane under high pressure, leaving the salt concentrate on one side of the membrane and desalinated water on the other.

At present, the Middle East is the largest market for desalination, but there are also large-scale desalination programmes in Australia, Algeria, the USA and Spain. South Africa also has a few desalination plants, although they are nowhere near the size of plants found in the larger markets. Until recently there were only three active desalination plants (for domestic purposes) in South Africa, namely a plant at the Bushmans River Mouth providing potable water to Kenton-on-Sea, one on Robben Island and one at Bitterfontein on the West Coast.

Recent droughts at the Southern Cape, however, have forced municipalities to consider desalination to augment dwindling supplies. Mossel Bay now has a desalination plant, as does Sedgfield, and the plants are slowly growing larger. George and Bitou are also in the process of

## BUILD YOUR OWN DESALINATION PLANT!

### Instructions

- Fill a bowl with salt water and set an empty glass at the centre.
- Cover the bowl – empty glass and all – with plastic wrap that has a small hole poked in the middle.
- Place the contraption in direct sunlight.

### How does it work?

- The salt water will evaporate, leaving salt crystals behind.
- The condensation that rises gathers on the plastic and drips into the empty glass.
- The result is fresh water that has been desalinated.

Source: [www.howstuffworks.com](http://www.howstuffworks.com)

acquiring desalination plants. Desalination is also considered by many coastal municipalities as a future option to grow water resources. Also, desalination does not only apply to seawater. Areas with groundwater resources that are brackish can also benefit from using desalination technology to make this water usable. □

## DID YOU KNOW?



- Around 97% of the world's water is too salty to drink.
- There are close to 14 500 desalination plants around the world. Over the last five years, on average 800 new desalination plants have been constructed every year.
- The world's largest desalination plants are located in the Middle East.
- Desalination plants provide more than 70% of the drinking water requirements of Saudi Arabia (more than ten million m<sup>3</sup>/day).
- The world's largest operational seawater reverse osmosis plant is located in Hadera, Israel, with a capacity of 500 000 m<sup>3</sup>/day of water (20% of Israel's domestic potable water requirement)

# Beneficial role of wetlands highlighted at seminar

South Africa's thousands of desecrated wetlands could have played an important role in mitigating some of the effects of the floods experienced at the start of 2011 had they not been destroyed. This was one of the main messages of the Wetlands seminar organised by the Agricultural Research Council's Institute for Soil Climate and Water (ARC-ISCW) and the International Mire

Conservation Group (IMCG) in February. The seminar was held to commemorate World Wetlands Day. More than 114 000 wetlands have been mapped in South Africa to date, covering around 8% of the country's surface area. Apart from their role in flood attenuation wetlands provide important services and goods to especially rural communities, while playing a role in improving water quality

and providing a habitat for many threatened and endangered species. Wetlands – especially peatlands – have also been shown to be natural carbon stores. The focus this year fell on forested wetlands of which only a few are found in South Africa. Most notable are the swamp forests situated along the country's Eastern coastline and of which very little is known.



*IMCG Chair Piet-Louis Grundling hands over a Certificate of Merit to ARC-ISCW Manager Dr Mpheko Maila in recognition of the council's work in the field of wetlands.*



*ARC-ISCW Manager Dr Mpheko Maila welcoming delegates to the event.*



*Water Research Commission Research Manager Bonani Madikizela was one of the speakers at the event. The Commission has spent R50-million on wetlands research in the last eight years.*



*Independent consultant Retief Grobler of Imperata Consulting explained the occurrence and importance of forested wetlands in South Africa.*

All photographs by Lani van Vuuren

# 2<sup>nd</sup> Conference of the Southern African YOUNG WATER PROFESSIONALS FINAL CONFERENCE ANNOUNCEMENT

3<sup>rd</sup>-5<sup>th</sup> July, 2011

CSIR ICC, Pretoria, South Africa

Organised by the

**Southern African Young Water Professionals**

under the auspices of the

**International Water Association (IWA) and Water Institute of Southern Africa (WISA)**



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*Sponsors page:* <http://www.wisa.org.za/ywp/ywpc2011/ywpcponsors2011.htm> on the conference website.



A conference for postgraduate students and young professionals (under the age of 35, **or** of any age who are still studying or who gained their qualifications less than five years ago) working in the water and wastewater sector in Africa.

# Water Research Commission



The Water Research Commission (WRC) is South Africa's dynamic hub for water-centred knowledge, innovation and intellectual capital. The WRC provides leadership for water research development in:

- Water Resource Management
- Water-Linked Ecosystems
- Water Use and Waste Management
- Water Utilisation in Agriculture
- Water-Centred Knowledge

Impact areas address the following key issues:

- Water and Society
- Water and Economy
- Water and the Environment
- Water and Health

[www.wrc.org.za](http://www.wrc.org.za)

